

# **GOVERNMENT POLYTECHNIC, KOLHAPUR**

(An Autonomous Institute of Government of Maharashtra)

*Curriculum Document*

**CURRICULUM: MPECS-2020**

**(Outcome Based Curriculum)**

For

**DIPLOMA IN CIVIL ENGINEERING**

**Secretary**

**Chairman**

**Programme wise Board of Studies (PBOS)**

**Civil Engineering Programme**

**Government Polytechnic, Kolhapur**

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**SECTION – I**

**CURRICULUM PHILOSOPHY**

**AND**

**STRUCTURE**

# **1. CURRICULUM DEVELOPMENT : INTRODUCTION AND PROCESS OF DEVELOPMENT OF OUTCOME BASED CURRICULUM**

## **Curriculum Design and Development:**

Curriculum is an absolute instructional and effective instrument designed with a student centered approach. It incorporates systematic method of teaching learning process. It is a sequence of planned academic activities; on completion of which the desired programme outcomes are expected to be attained in the student. The curriculum and the course contents are expected to motivate the students to acquire desired level of knowledge and skills. An emphasis and an attempt has been made in the curriculum to get a perfect blending of theoretical concepts and actual requirements of industry. Keen attention has been provided to make it more structured by incorporating the valuable suggestions of industrial experts of PBOs and feed back by the field and academic professionals. An overview of systematic and scientific mode of implementation and evaluation has also been pondered; consequently a practicable model of it has been achieved. It incorporates specific guidelines and assessment criteria for theory/practical/oral modes of evaluation. Specification table for each course has been provided to prepare question paper justifying meticulous coverage.

## **Curriculum philosophy:**

The impacts of globalization and rapid changes in the engineering science and technology have been a great cause of comprehensive and noticeable change in engineering fraternity, hence the institutions. Only way to incorporate such a transformation, is to modify the curriculum, preserving the consistency of engineering education. Frequent review and feedback from the experts and the freedom of autonomous status of the institution have encouraged undertaking relevant changes in the curriculum to make it versatile. Consequently the desired competencies and skills are transformed among the students in pursuing their preparedness to cope up with the global changes. It aims to promote self reliance and satisfaction of acquiring modern engineering concepts and multi capabilities within the students to make them model technicians.

**“Curriculum is an educational program designed and implemented to achieve specified programme outcomes”**

Hence, in a broad sense, a curriculum incorporates the following:

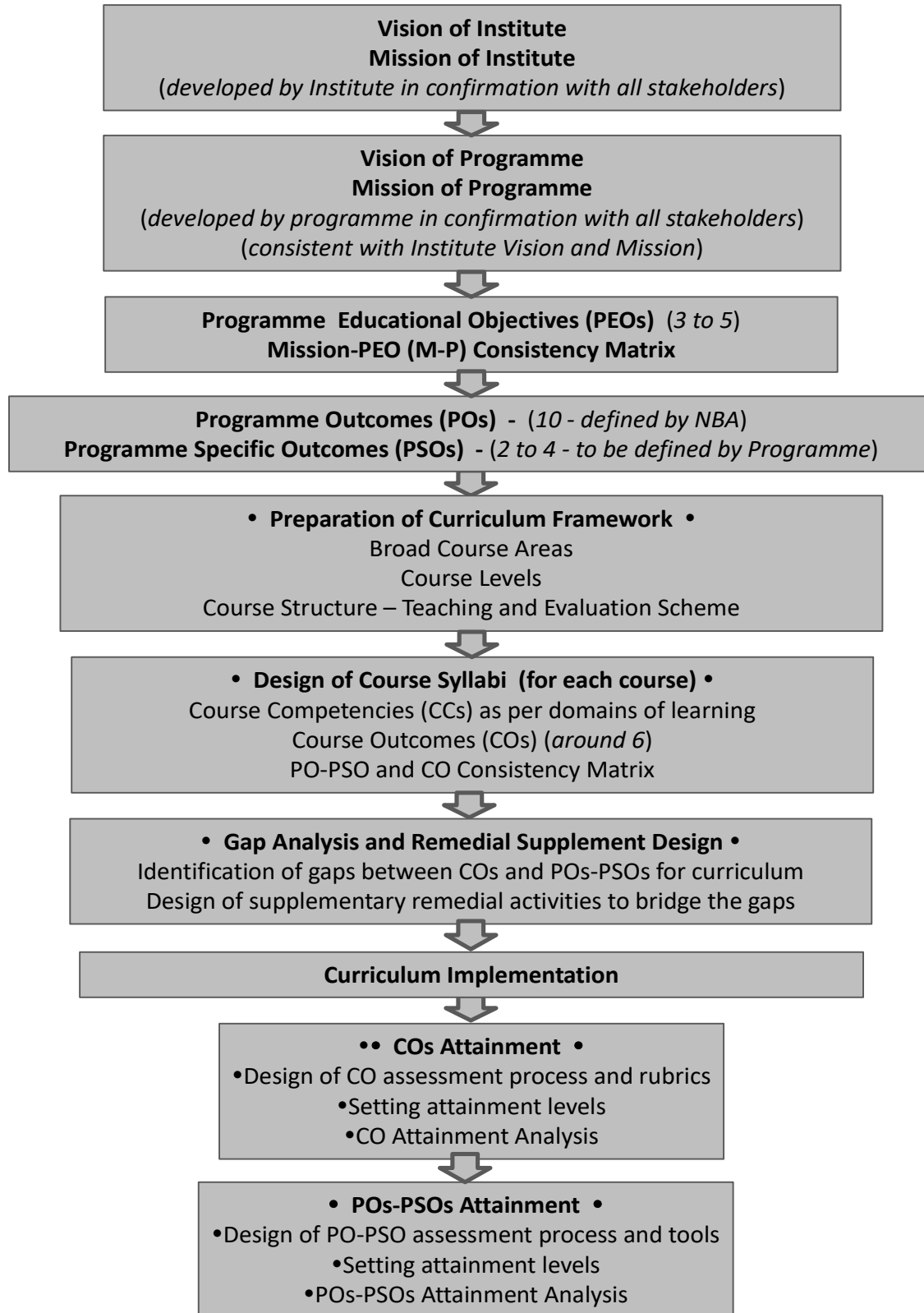
- To define the purpose of education
- To accept systematic planning methods
- To confirm implementation strategies
- To identify and to incorporate needs of industries
- To follow the policy directives
- To cope-up with social concerns
- To aim at personality development of students
- To allow future developments and challenges in emerging Science and technology.

**Outcome-based Curriculum (OBC)**

Outcome based curriculum is the curriculum based on the concepts of outcome-based education (OBE) philosophy. India is a permanent signatory of the Washington Accord - the international agreement among bodies responsible for accrediting engineering programmes with the National Board of Accreditation (NBA) as the national authority for accrediting degree and diploma programmes in engineering in India. Hence as per the accreditation criteria of the NBA, the curriculum of the Institute is expected to be outcome based.

Outcome Based Education (OBE) is an educational approach in which all the activities of an education system are based on attainment of pre-defined learning outcomes of student. The approach is to be included in the following three aspects of education system :i) Curriculum Design, ii) Curriculum Implementation, iii) Students’ Evaluation. The flow diagram shown below summarizes the elements of Outcome-based Education System. The glossary of terms used in academic autonomy and OBE are provided for reference.

### OUTCOME BASED EDUCATION SYSTEM



## **Glossary of terms related to Outcome Based Education**

**Outcome-Based Education (OBE)** - It is an educational approach in which all the activities of an education system are based on attainment of pre-defined learning outcomes of student.

The approach is to be included in the following three aspects of education system: i) Curriculum Design, ii) Curriculum Implementation, iii) Students' Evaluation

**Washington Accord and NBA** – It is an International Agreement among bodies responsible for accrediting undergraduate engineering degree programmes. Established in 1989, the signatory countries as of 2014 are Australia, Canada, Taiwan, Hong Kong, India, Ireland, Japan, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Sri Lanka, Turkey, the United Kingdom and the United States. National Board of Accreditation (NBA), India has become the permanent signatory member of the Washington Accord on 13<sup>th</sup> June 2014.

The membership of Washington Accord is an international recognition of the quality of undergraduate engineering education offered by the member country and is an avenue to bring it into the world class category. It encourages and facilitates the mobility of engineering graduates and professionals at international level.

NBA accreditation is a quality assurance scheme for higher technical education in India.

The Washington Accord covers engineering degrees and diploma under outcome-based education approach.

**Vision of Institute** - It is a statement that defines concisely the aspirations to be achieved in the near future by the Institute

**Mission of Institute** - It is a set of statements that defines the broad steps to be executed to achieve the vision of the Institute

**Vision of Programme** - It is the vision statement for a particular educational programme (like Civil Engineering Programme, Mechanical Engineering Programme, etc.). Programme Vision should be consistent with the Institute vision

**Mission of Programme** - It is the set of statements that define the broad steps to be executed to achieve the vision of the educational programme

**Programme Educational Objectives (PEOs)** - It is a set of 3 to 5 statements defining the objectives to be attained in order to execute the mission

**Programme Outcomes (POs)** – It is a set of ten generic outcomes, stated by NBA, expected from any engineering diploma-holder in India

**Programme-specific Outcomes (PSOs)** – It is a set of 2 to 4 outcomes to be defined by the programme under consideration in addition to the POs

**Course Outcomes (COs)** – It a set of about 6 outcomes, expected to be attained by student on learning a course. Course Outcomes shall be defined in curriculum for each course. Course outcomes are worded using action verbs like solve, explain, calculate, compare, distinguish, describe, draw, etc.

**Mission-PEO Consistency Matrix** – It is a matrix showing degree of consistency of PEOs with mission

**PO-CO Consistency Matrix** – It is a matrix showing degree of consistency of COs with POs and PSOs

**Competency** – It is the set of specific abilities, categorized as cognitive, psychomotor and affective domains of learning, from which course outcomes statements are derived

**Cognitive domain** –It is the set of abilities related to thinking

**Bloom’s Revised Taxonomy of Cognitive Domain:**It is a six-level cumulative hierarchy of cognitive abilities in the order of increasing complexity as follows:

Remembering > Understanding > Applying > Analyzing > Evaluating > Creating

**Psychomotor Domain:**It is the set of abilities related to physical and psychological skills

**Taxonomy of Psychomotor Domain:**It is a six-level cumulative hierarchy of cognitive abilities in the order of increasing complexity as follows:

Perception > Set > Guided response > Mechanism > Adaptation > Origination

**Affective Domain:** It is the set of abilities related to attitudinal development

**Taxonomy of Affective Domain:**It is a five-level cumulative hierarchy of affective abilities in the order of increasing complexity as follows :

Receiving > Responding > Valuing > Organizing > Characterizing



**Educational Technology:** It is the systematic study of theoretical foundations and material tools to facilitate learning

### **Glossary of terms used in Academic Autonomy and MPECS**

**Academic Autonomy** – It is the freedom and responsibility offered to the Institute by the Government to attain high quality standards in the following three dimensions:

- i) Design of own curricula
- ii) Conduct of own examinations
- iii) Award of own diploma

**Multi-point Entry and Credit System (MPECS)** – It is a system of education in which student can be admitted at different entry levels of qualification and he is offered *credits* along with marks on passing in a course

**Credits** – It is the number of weekly instructional hours provided for a course in the curriculum

**Programme** – It is the particular branch of Engineering in which Diploma is awarded. e.g. Civil Engineering Programme, Mechanical Engineering Programme, etc.

**Curriculum** – It is a document providing plan of the complete academic activity to be conducted by student for award of Diploma in a Programme in tune with the vision of the Institute

**Course** – It is a particular subject defining study and evaluation unit of the curriculum. e.g. Applied Mechanics, Engineering Drawing-1, etc.

**Syllabus** – It is the complete academic information regarding a particular course in a curriculum

**Course Registration (CR)** - It is the procedure to be carried out by every student at the beginning of every semester in which he/she has to declare the courses he/she is going to study in that semester as per academic time table of the Institute. The registration is to be done as per *Rules of Registration* of the Institute.

**Examination Registration (ER)** - It is the procedure to be carried out by every student at the beginning of every semester in which he/she has to declare the courses in which he/she is going appear for examination in that semester as per examination time table of the Institute. The registration is to be done as per *Rules of Registration* of the Institute.

**Curriculum MPECS-2020** - It is the Curriculum of the Institute revised in the year 2016. It is applicable to the students admitted since 2020

**Programme Department** – It is the department of the Institute offering Diploma in a particular Programme. e.g. Civil Engineering Department, Mechanical Engineering Department, etc.

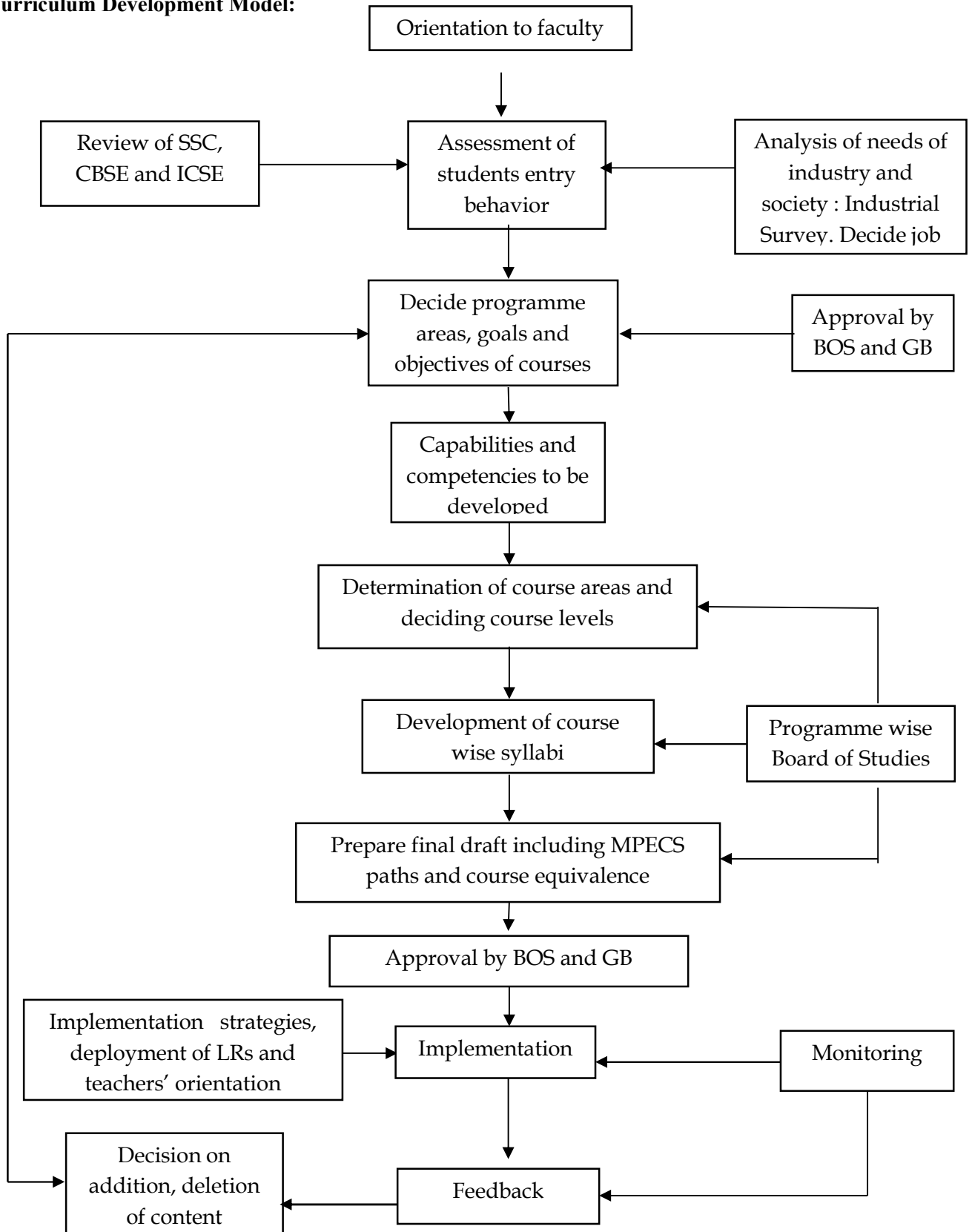
**Programme Dean** – He/she is the Head of Department of a Programme Department

**Allied Department** – It is department that does not award diploma and contributes to curriculum implementation of many Programmes. e.g. Applied Mechanics Department, Workshop Department, Science Department, English Department, Mathematics Department, etc.

**Academic Autonomy and MPECS at Government Polytechnic, Kolhapur –**

- Year of award of academic autonomy : 1992        Year of award of MPECS and Flexibility : 1994  
Government Polytechnic, Kolhapur is the first Government Polytechnic in Maharashtra to have been awarded academic autonomy
- Bodies and Cells under Academic Autonomy :
  - i) Governing Body
  - ii) Board of Studies
  - iii) Programme-wise Boards of Studies
- Examination Committee Curriculum Revisions under Autonomy : 1992, MPECS-2001, MPECS-2006, MPECS-2010, MPECS-2013, MPECS-2016
- Award of Diploma in *Convocation Ceremony* every year

**Curriculum Development Model:**



## **2. VISION, MISSION, PROGRAMME EDUCATIONAL OBJECTIVES (PEOs), PROGRAMME OUTCOMES (POs) AND PROGRAMME-SPECIFIC OUTCOMES (PSOs)**

### **Vision of Institute:**

Institute of high recognition developing competent technicians for quality services and entrepreneurship to cater the needs of industry and society.

### **Mission of Institute:**

- To educate and train in multi-disciplinary multi-level programmes to develop technicians and skilled manpower having global competency
- To ensure employability, encourage entrepreneurship, promote lifelong learning
- To inculcate in the students the qualities of a good citizen at individual, social and professional level
- To provide quality management system with focus on effective student-centric education
- To utilize faculty expertise and Institute infrastructure to render quality consultancy services

### **Vision of Programme :**

Civil engineering technicians having global competencies for quality services and entrepreneurship for infrastructure development of the nation

### **Mission of Programme:**

1. To educate and train the technical manpower of high competency in Civil Engineering.
2. To ensure employability, encourage entrepreneurship, promote lifelong inter-disciplinary liaison to face ever changing needs, risks and constraints.
3. To generate civil engineering technicians who successfully adapt to local situations and provide innovative solutions for the betterment of the society.
4. To provide and implement quality management system for civil engineering technician education.

### **Programme Educational Objectives (PEOs):**

1. Adopt prevailing Civil Engineering based technology to solve current Civil Engineering problems as well as inter-disciplinary.
2. Provide responsible and eco-friendly solutions to Civil Engineering based problems in ethical standards and leadership qualities.
3. Contribute as an individual or as a team member by probing, analyzing and communicating effectively to solve relevant problems.

**Programme Outcomes (POs)**

- 1. Basic knowledge and Discipline Knowledge:** Apply knowledge of basic mathematics, Science and Engineering fundamentals and engineering specialization to solve the engineering problems.
- 2. Problem Analysis** – Identify and analyze well defined engineering problems using codified standard method.
- 3. Design /Development of solutions** – Design solutions for well defined technical problems and assist with design of system components and process to meet specified needs.
- 4. Engineering Tools, Experimentation & Testing-** Apply modern engineering tools and appropriate technique to conduct standard tests and measurement.
- 5. Engineering Practices for society, sustainability and environment** – Apply appropriate technology in context of society, sustainability, environment and ethical practices.
- 6. Project Management-** Using Engineering management principles individually, as a team member or a leader to manage project and effectively communicate about well defined engineering activities.
- 7. Life- long learning-** Ability to analyze individual needs and engage in updating in context of technological changes.

**Programme Specific Outcomes (PSOs)**

1. To plan for collection of data, prepare design, drawings and estimate.
2. To develop supervisory and middle level management skills for construction and maintenance of Civil Engineering structures.
3. To take decisions to identify and solve problems on construction sites.

**Job profiles and related competencies for the diploma holder :**

**1) Supervision of Construction site.**

- a) Prepare working drawings, work out quantities, organise site, prepare schedules of activities and labour schedule.

- b) supervise construction with focus on adhering to sequence of activities as per schedule ensuring quality control at each stage of construction, handling labour problem, maintaining progress,
- c) Carry out measurement and process payment of bills.

**2) *Repair and maintenance Section.***

- a) Prepare schedules for preventive as well as routine maintenance Section.
- b) Organize physical as well as human resources for implementing maintenance schedule.
- c) Obtain progress report of maintenance at regular intervals.

**3) *Drawing and Estimating Section***

- a) Study designs of civil Engg. structures and drawings.
- b) Prepare both submission as well as working drawings of individual components.
- c) Prepare various types of estimates and frame specification from project drawing.
- d) Prepare tender papers.
- e) Process Tender from
- f) Assess the values of property.

**4) *Design and Planning section***

Provide survey data necessary for design of Civil Engg. structures.

**5) *In House R & D***

Works as Assistant to Development Engineer.

Assist development Engineer in preparing drawings of prototypes, conduct pilot testing of products and processing and also conduct small scale field tests.

**6) *General***

- i) Capable of handling independent works.
- ii) Carry purchase of general equipments & Materials related to project.
- iii) Become an entrepreneur
- iv) Work on computer.
- v) Obtain / select proper consultant for project.

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### 3. OVERVIEW AND SALIENT FEATURES OF CURRICULUM: MPECS-2020

#### 3.1 Overview of Curriculum MPECS-2020

|                                |         |      |
|--------------------------------|---------|------|
| Total No. of Credits           |         | 180  |
| No. of courses offered         | Total   | 42   |
|                                | Theory  | 29   |
| Max. no. courses in a semester |         | 9    |
| Total Maximum Marks            |         | 4500 |
| Courses in Level IV and V      | No.     | 15   |
|                                | Credits | 63   |
|                                | Marks   | 1700 |
| Courses in Level I             | No.     | 10   |
|                                | Credits | 39   |
|                                | Marks   | 975  |
| Courses in Level II            | No.     | 05   |
|                                | Credits | 13   |
|                                | Marks   | 200  |
| Courses in Level III           | No.     | 12   |
|                                | Credits | 65   |
|                                | Marks   | 1625 |
| Courses in Level IV            | No.     | 06   |
|                                | Credits | 33   |
|                                | Marks   | 875  |
| Courses in                     | No.     | 09   |

|                              |                |                        |
|------------------------------|----------------|------------------------|
| Level V                      | Credits        | 30                     |
|                              | Marks          | 825                    |
| %Ratio of<br>Th:Pr           | Marks-wise     | 2850:1650<br>63% : 37% |
|                              | Credit-wise    | 98 : 82<br>54% : 46%   |
| No. of Allied Courses        |                | 02                     |
| Optional<br>Courses          | No. of courses | 03                     |
|                              | Options/course | 04                     |
| No. of<br>Practical<br>Exams | Internal       | 14                     |
|                              | External       | 07                     |
| No. of Orals                 | Internal       | 04                     |
|                              | External       | 11                     |

**Diploma shall be awarded on the basis of marks obtained in Level IV and Level V courses**

**Details about revised levels, credits and marks.**

| Level        | No Of Courses | Credits    | Total Marks |
|--------------|---------------|------------|-------------|
| 1            | 10            | 39         | 975         |
| 2            | 05            | 13         | 200         |
| 3            | 12            | 65         | 1575        |
| 4            | 06            | 33         | 875         |
| 5            | 09            | 30         | 875         |
| <b>Total</b> | <b>42</b>     | <b>180</b> | <b>4500</b> |



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## **Salient Features of Curriculum MPECS-2020**

### **3.1 Major modification in MPECS2020 with respect to MPECS2016 –**

1)

| <b>Sr No</b> | <b>Major changes in following Points</b> | <b>MPECS2016</b> | <b>MPECS2020</b> |
|--------------|--|------------------|------------------|
| 1            | Total maximum marks                      | 4400             | 4500             |
| 2            | Total marks of level IV and level V      | 1600             | 1700             |
| 3            | Total number courses                     | 38               | 42               |

2) Introducing Construction management (CEG501) again as branch specific course instead of Industrial Organization Management (CCG501).

### **3.2 Addition of courses with respect to MPECS 2016**

- 1) Addition of no exam course i.e. Sports and Yoga (CCG117) at level 1 Foundation courses has been done.
- 2) Addition of Introduction to IT System (CCG201) at level 2 Life skill and Professional skills courses has been done.
- 3) Addition of Fundamentals of Electrical and Electronics Engg (CCG202) at level 2 Life skill and Professional skills courses has been done.
- 4) Addition of non credit course i.e. Essence of Indian Traditional Knowledge (CCG205) at level 2 Life skill and Professional skills courses has been done.
- 5) Addition of non credit course i.e. Indian Constitution (CCG206) at level 2 Life skill and Professional skills courses has been done.
- 6) Addition of Entrepreneurship and Start ups (CCG501) at level 5 Management and Diversified Technology Courses has been done.

### **3.2 Deletion of courses with respect to MPECS 2016**

- 1) Deletion of Generic Skill (CCF201) at Level II: Life Skills and Professional Skills Courses has been done.
- 2) Deletion of Professional Practices (CCF203) at level 2 Life skill and Professional skills courses has been done.
- 3) Deletion of Professional Practices-Civil (CEF405) at level 4 Applied Technology courses has been done.
- 4) Deletion of Construction Field Skills (CEF503) at level 5 Management and Diversified Technology Courses has been done.

### **3.3 Other salient features:**

1. **Industrial training:** - (four weeks) internship I after completion of fourth semester during summer vacation.  
( three weeks) Internship II is introduced after completion of fifth semester during winter vacation.

### 4. TEACHING AND EXAMINATION SCHEME (LEVEL-WISE)

| S<br>N  | Name of Course   | Course<br>Code | Course<br>Abbrevi<br>a-tion | L<br>e<br>v<br>e | Pre-<br>re-<br>qui-<br>site<br>Course | Teaching Scheme<br>(hours per week) |                           |    | Examination Scheme<br>(marks) |    |        |      |       |
|---|--|----------------|-----------------------------|------------------|---------------------------------------|-------------------------------------|---------------------------|----|-------------------------------|----|--------|------|-------|
|   |  |                |                             |                  |                                       | Th                                  | Pract. /<br>Drg. /<br>Tut | Cr | Th                            | TS | T<br>W | Pr   | Or    |
| <b>Level 1: Foundation Courses</b>                            |  |                |                             |                  |                                       |                                     |                           |    |                               |    |        |      |       |
| 1   | Engineering Physics                                    | CCG101         | GPHA                        | 1                | -                                     | 03                                  | 02(P)                     | 05 | 80                            | 20 | -      | 50 I | -     |
| 2   | Engineering Chemistry                                  | CCG103         | GCHA                        | 1                | -                                     | 03                                  | 02(P)                     | 05 | 80                            | 20 | -      | 50 I | -     |
| 3   | Basic Mathematics                                      | CCG105         | GBMT                        | 1                | -                                     | 03                                  | 01(T)                     | 04 | 80                            | 20 | -      | -    | -     |
| 4   | Engineering Mathematics                                | CCG106         | GEMT                        | 1                | CCG105                                | 03                                  | 01(T)                     | 04 | 80                            | 20 | -      | -    | -     |
| 5   | Engineering Drawing – 1                                | CCG107         | GEDA                        | 1                | -                                     | 03                                  | 02(D)                     | 05 | 80                            | 20 | -      | 25 I | -     |
| 6   | Engineering Drawing – 2                                | CCG108         | GEDB                        | 1                | CCG107                                | 03                                  | 02(D)                     | 05 | 80                            | 20 | -      | 25 I | -     |
| 7   | Applied Mechanics                                      | CCG110         | GAPM                        | 1                | -                                     | 03                                  | 02(P)                     | 05 | 80                            | 20 | -      | 25 I | -     |
| 8   | Workshop Practice -I(Civil Engg)                       | CCG111         | GWSA                        | 1                | -                                     | 00                                  | 02(P)                     | 02 | -                             | -  | -      | 50 I | -     |
| 9   | Workshop Practice-II (Civil Engg)                      | CCG115         | GWSE                        | 1                | CCG111                                | 00                                  | 02(P)                     | 02 | -                             | -  | -      | 50 I | -     |
| 10  | Sports & Yoga  | CCG117         | GSPY                        | 1                | -                                     | -                                   | 02(P)                     | 02 | -                             | -  | -      | -    | -     |
| <b>Level 2 : Life Skills and Professional Skills Courses</b>  |  |                |                             |                  |                                       |                                     |                           |    |                               |    |        |      |       |
| 11  | Introduction to IT System                              | CCG201         | GITS                        | 2                | -                                     | 02                                  | 02(P)                     | 04 | -                             | -  | -      | 50 I | -     |
| 12  | Fundamentals of Electrical and Electronics Engineering | CCG202         | GEED                        | 2                | -                                     | 02                                  | 02(P)                     | 04 | -                             | -  | -      | 50 I | -     |
| 13  | Communication Skills                                   | CCG203         | GCMS                        | 2                | --                                    | 03                                  | 02(P)                     | 05 | 40                            | 10 | -      | 50 I | -     |
| 14  | Essence of Indian Traditional Knowledge                | CCG205         | GITK                        | 2                | -                                     | 02                                  | 00                        | 00 | -                             | -  | -      | -    | -     |
| 15  | Indian Constitution                                    | CCG206         | GINC                        | 2                | -                                     | 02                                  | 00                        | 00 | -                             | -  | -      | -    | -     |
| <b>Level 3: Basic Technology Courses</b>                      |  |                |                             |                  |                                       |                                     |                           |    |                               |    |        |      |       |
| 16  | Applied Mathematics                                    | CEG301         | GAMT                        | 3                | CCG105<br>CCG106                      | 03                                  | 01 (T)                    | 04 | 80                            | 20 | -      | -    | -     |
| 17  | Building Construction                                  | CEG302         | GBCO                        | 3                | --                                    | 04                                  | 02                        | 06 | 80                            | 20 | -      | -    | 75 E  |
| 18  | Building Drawing                                       | CEG303         | GBDR                        | 3                | CCG107<br>CCG108                      | 02                                  | 4                         | 06 | 80                            | 20 | -      | -    | 75 E  |
| 19  | Computer Aided Drawing                                 | CEG304         | GCAD                        | 3                | -                                     | --                                  | 04                        | 04 | -                             | -  | -      | 50 I | -     |
| 20  | Soil Mechanics And Foundation Engineering              | CEG305         | GSMF                        | 3                | CCG110                                | 03                                  | 02                        | 05 | 80                            | 20 | -      | -    | 50 I  |
| 21  | Hydraulics   | CEG306         | GHYD                        | 3                | CCG110                                | 04                                  | 02                        | 06 | 80                            | 20 | -      | -    | 50 E  |
| 22  | Mechanics of Structures                                | CEG307         | GMOS                        | 3                | CCG110                                | 03                                  | 02                        | 05 | 80                            | 20 | -      | -    | 50 I  |
| 23  | Surveying - 1  | CEG308         | GSV1                        | 3                | --                                    | 03                                  | 04                        | 07 | 80                            | 20 | -      | 75 E | -     |
| 24  | Surveying - 2  | CEG309         | GSV2                        | 3                | CEG308                                | 03                                  | 04                        | 07 | 80                            | 20 | -      | 75 E | -     |
| 25  | Transportation Engg                                    | CEG310         | GTRE                        | 3                | --                                    | 04                                  | 02                        | 06 | 80                            | 20 | -      | -    | 50 I  |
| 26  | Elective-1 <from list of options>                      | CEG311-315     | -                           | 3                | --                                    | 03                                  | 02                        | 05 | 80                            | 20 | -      | -    | 25I   |
| <b>Level 4: Applied Technology Courses</b>                    |  |                |                             |                  |                                       |                                     |                           |    |                               |    |        |      |       |
| 27  | Analysis of Structure                                  | CEG 401        | GAOS                        | 4                | CEG307                                | 03                                  | 01(T)                     | 04 | 80                            | 20 | -      | -    | -     |
| 28  | Design And Drafting Of RCC Structures                  | CEG 402        | GRCC                        | 4                | CEG307                                | 04                                  | 02                        | 06 | 80                            | 20 | -      | -    | 50 E  |
| 29  | Design And Drafting Of Steel Structures                | CEG 403        | GDSS                        | 4                | CEG307                                | 03                                  | 02                        | 05 | 80                            | 20 | -      | -    | 50 I  |
| 30  | Estimating And Costing                                 | CEG 404        | GEAC                        | 4                | CEG303                                | 04                                  | 04                        | 08 | 80                            | 20 | -      | -    | 75 E  |
| 31  | Concrete Technology                                    | CEG 405        | GCTE                        | 4                | --                                    | 03                                  | 02                        | 05 | 80                            | 20 | -      | 75 I | -     |
| 32  | Elective-2 <from list of options>                      | CEG 406-409    | -                           | 4                | -                                     | 03                                  | 02                        | 05 | 80                            | 20 | -      | -    | 25 I  |
| <b>Level 5: Management and Diversified Technology Courses</b> |  |                |                             |                  |                                       |                                     |                           |    |                               |    |        |      |       |
| 33  | Civil Engg. Project I                                  | CEG501         | GCPI                        | 5                | --                                    | 02                                  | 02                        | 02 | -                             | -  | -      | -    | 50 I  |
| 34  | Civil Engg. Project II                                 | CEG502         | GCPII                       | 5                | CEG501                                | 04                                  | 04                        | 04 | -                             | -  | -      | -    | 100 E |
| 35  | Construction Management                                | CEG503         | GCNM                        | 5                | --                                    | 03                                  | -                         | 03 | 80                            | 20 | -      | -    | -     |
| 36  | Contracts and Accounts                                 | CEG504         | GCAA                        | 5                | -                                     | 03                                  | -                         | 03 | 80                            | 20 | -      | -    | -     |
| 37  | Environmental Engg.                                    | CEG505         | GENE                        | 5                | --                                    | 04                                  | 02                        | 06 | 80                            | 20 | -      | -    | 50E   |
| 38  | Irrigation Engg.                                       | CEG506         | GIRE                        | 5                | --                                    | 03                                  | 01                        | 04 | 80                            | 20 | -      | -    | 25E   |
| 39  | Elective-3 <from list of options>                      | CEG507-CEG510  | -                           | 5                | -                                     | 03                                  | -                         | 03 | 80                            | 20 | -      | -    | -     |
| 40  | Internship 1 (4 weeks)                                 | CCG502         | GINO                        | 5                | -                                     | -                                   | -                         | 03 | -                             | -  | -      | 50 E | -     |
| 41  | Internship 2 (3 weeks)                                 | CCG503         | GINT                        | 5                | -                                     | -                                   | -                         | 02 | -                             | -  | -      | 50 E | -     |
| 42  | Entrepreneurship & start-ups                           | CCG501         | GESU                        | 5                | -                                     | 02                                  | 02(P)                     | 04 | -                             | -  | -      | -    | 50 I  |

## Optional Courses for Electives

| S<br>N   | Name of<br>Course                             | Course<br>Code | Course<br>Abbrevia-<br>tion | Level | Pre-<br>requi-<br>site<br>Course | Teaching Scheme<br>(hours per week) |                                |         | Examination Scheme<br>(marks) |    |    |    |      |
|--|---|----------------|-----------------------------|-------|----------------------------------|-------------------------------------|--------------------------------|---------|-------------------------------|----|----|----|------|
|  |   |                |                             |       |                                  | Th                                  | Pract. /<br>Drg. /<br>Tutorial | Credits | Th                            | TS | TW | Pr | Or   |
| <b>Elective – 1 (ANY ONE) : Basic Technology Group</b>       |   |                |                             |       |                                  |                                     |                                |         |                               |    |    |    |      |
| 1  | Advanced Construction Techniques & Equipments | CEG311         | GACT                        | 3     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 2  | Adv. Construction Materials                   | CEG312         | GACM                        | 3     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 3  | Higher Mathematics                            | CEG313         | GHMT                        | 3     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 4  | Maintenance & Rehabilitation of Structures    | CEG314         | GMRS                        | 3     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 5  | Energy Conservation & Green Building          | CEG315         | GECG                        | 3     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| <b>Elective – 2 (ANY ONE) : Applied Technology Group</b>     |   |                |                             |       |                                  |                                     |                                |         |                               |    |    |    |      |
| 6  | Building Services                             | CEG406         | GBSR                        | 4     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 7  | Plumbing Services                             | CEG407         | GPSR                        | 4     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 8  | Quality Control                               | CEG408         | GQCO                        | 4     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| 9  | Town & Country Planning                       | CEG409         | GTCP                        | 4     | -                                | 03                                  | 02                             | 05      | 80                            | 20 | -  | -  | 25 I |
| <b>Elective – 3 (ANY ONE) : Diversified Technology Group</b> |   |                |                             |       |                                  |                                     |                                |         |                               |    |    |    |      |
| 10   | Earthquake Engineering                        | CEG507         | GEQE                        | 5     | -                                | 03                                  | 00                             | 03      | 80                            | 20 | -  | -  | -    |
| 11   | Industrial Waste Management                   | CEG508         | GIWM                        | 5     | -                                | 03                                  | 00                             | 03      | 80                            | 20 | -  | -  | -    |
| 12   | Solid Waste Management                        | CEG509         | GSWM                        | 5     | -                                | 03                                  | 00                             | 03      | 80                            | 20 | -  | -  | -    |
| 13   | Watershed Management                          | CEG510         | GWSM                        | 5     | -                                | 03                                  | 00                             | 03      | 80                            | 20 | -  | -  | -    |

## 5. PATH-WISE COURSE STRUCTURES

### Semester-wise Course Structure

#### Path-1: Students admitted to First Year - X std. pass outs

| SR NO             | Name of Course                            | Course Code   | Course Abbreviation | Level | Pre-requi-site Course | Teaching Scheme (hours per week) |                          |           | Examination Scheme (Marks) |    |    |            |            |
|-------------------|---|---------------|---------------------|-------|-----------------------|----------------------------------|--------------------------|-----------|----------------------------|----|----|------------|------------|
|                   |   |               |                     |       |                       | Th                               | Pract. / Drg. / Tutorial | Credits   | Th                         | TS | TW | Pr         | Or         |
| <b>Semester 1</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 1                 | Engineering Chemistry                     | CCG103        | GCHA                | 1     | Nil                   | 03                               | 02                       | 05        | 80                         | 20 | -  | 50 I       | -          |
| 2                 | Basic Mathematics                         | CCG105        | GBMT                | 1     | Nil                   | 03                               | 01                       | 04        | 80                         | 20 | -  | -          | -          |
| 3                 | Engineering Drawing 1                     | CCG107        | GEDA                | 1     | Nil                   | 03                               | 02                       | 05        | 80                         | 20 | -  | 25 I       | -          |
| 4                 | Workshop Practice 1                       | CCG111        | GWSA                | 1     | Nil                   | -                                | 02                       | 02        | -                          | -  | -  | 50 I       | -          |
| 5                 | Communication Skills                      | CCG203        | GCMS                | 2     | Nil                   | 03                               | 02                       | 05        | 40                         | 10 | -  | 50 I       | -          |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>21</b> | <b>350</b>                 |    |    | <b>175</b> |            |
| <b>Semester 2</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 6                 | Engineering Physics                       | CCG101        | GPHA                | 1     | Nil                   | 03                               | 02(P)                    | 05        | 80                         | 20 | -  | 50 I       | -          |
| 7                 | Engineering Mathematics                   | CCG106        | GEMT                | 1     | CCG105                | 03                               | 01                       | 04        | 80                         | 20 | -  | -          | -          |
| 8                 | Engineering Drawing 2                     | CCG108        | GEDB                | 1     | CCG107                | 03                               | 02                       | 05        | 80                         | 20 | -  | 25 I       | -          |
| 9                 | Applied Mechanics                         | CCG110        | GAPM                | 1     | Nil                   | 03                               | 02                       | 05        | 80                         | 20 | -  | 25 I       | -          |
| 10                | Workshop Practice 2                       | CCG115        | GWSE                | 1     | CCG111                | -                                | 02                       | 02        | -                          | -  | -  | 50 I       | -          |
| 11                | Introduction to IT system                 | CCG201        | GITS                | 2     | NIL                   | 02                               | 02                       | 04        | -                          | -  | -  | 50 I       | -          |
| 12                | Sports & Yoga                             | CCG117        | GSPY                | 1     | NIL                   | -                                | 02                       | 02        | -                          | -  | -  | -          | -          |
| 13                | Fundamentals of Elect. & Electronics Engg | CCG202        | GEEE                | 2     | Nil                   | 02                               | 02                       | 04        | -                          | -  | -  | 50 I       | -          |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>31</b> | <b>400</b>                 |    |    | <b>250</b> |            |
| <b>Semester 3</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 14                | Applied Mathematics                       | CEG301        | GAMT                | 3     | CCG105<br>CCG106      | 03                               | 01                       | 04        | 80                         | 20 | -  | -          | -          |
| 15                | Building Construction                     | CEG302        | GBCO                | 3     | -                     | 04                               | 02                       | 06        | 80                         | 20 | -  | -          | 75E        |
| 16                | Building Drawing                          | CEG303        | GBDR                | 3     | CCG107<br>CCG108      | 02                               | 04                       | 06        | 80                         | 20 | -  | -          | 75E        |
| 17                | Soil Mechanics & Foundation Engineering   | CEG305        | GSMF                | 3     | CCG110                | 03                               | 02                       | 05        | 80                         | 20 | -  | -          | 50 I       |
| 18                | Mechanics of Structures                   | CEG307        | GMOS                | 3     | CCG110                | 03                               | 02                       | 05        | 80                         | 20 | -  | -          | 50 I       |
| 19                | Surveying-1                               | CEG308        | GSV1                | 3     | -                     | 03                               | 04                       | 07        | 80                         | 20 | -  | 75 E       | -          |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>33</b> | <b>600</b>                 |    |    | <b>75</b>  | <b>250</b> |
| <b>Semester 4</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 20                | Surveying- 2                              | CEG309        | GSV2                | 3     | CEG308                | 03                               | 04                       | 07        | 80                         | 20 |    | 75E        | -          |
| 21                | Transportation Engineering                | CEG310        | GTRE                | 3     | -                     | 04                               | 02                       | 06        | 80                         | 20 |    | -          | 50 I       |
| 22                | Hydraulics                                | CEG306        | GHYD                | 3     | CCG110                | 04                               | 02                       | 06        | 80                         | 20 |    | -          | 50 E       |
| 23                | Concrete Technology                       | CEG405        | GCTE                | 4     | -                     | 03                               | 02                       | 05        | 80                         | 20 |    | 75 I       | -          |
| 24                | Elective-1 <from list of options>         | CEG311 to 315 | -                   | 3     | -                     | 03                               | 02                       | 05        | 80                         | 20 |    | -          | 25 I       |
| 25                | Essence of Indian Tradition & knowledge   | CCG205        | GITK                | 2     | NIL                   | 02                               | 00                       | 00        | -                          | -  | -  | -          | -          |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>29</b> | <b>500</b>                 |    |    | <b>150</b> | <b>125</b> |

| SR NO             | Name of Course                         | Course Code   | Course Abbreviation | Level | Pre-requisite Course | Teaching Scheme (hours per week) |                          |           | Examination Scheme (Marks) |    |    |            |            |
|-------------------|--|---------------|---------------------|-------|----------------------|----------------------------------|--------------------------|-----------|----------------------------|----|----|------------|------------|
|                   |  |               |                     |       |                      | Th                               | Pract. / Drg. / Tutorial | Credits   | Th                         | TS | TW | Pr         | Or         |
| <b>Semester 5</b> |  |               |                     |       |                      |                                  |                          |           |                            |    |    |            |            |
| 26                | Computer Aided drawing                 | CEG304        | GCAD                | 3     | -                    | --                               | 04                       | 04        | --                         | -- |    | 50 I       | --         |
| 27                | Analysis of Structure                  | CEG401        | GAOS                | 4     | CEG307               | 03                               | 01 (T)                   | 04        | 80                         | 20 | -  | -          | -          |
| 28                | Design & Drafting of Steel Structures  | CEG403        | GDSS                | 4     | CEG307               | 03                               | 02                       | 05        | 80                         | 20 | -  | -          | 50 I       |
| 29                | Contracts and Accounts                 | CEG504        | GCAA                | 5     | -                    | 03                               | -                        | 03        | 80                         | 20 | -  | -          | -          |
| 30                | Environmental Engineering              | CEG505        | GENE                | 5     | -                    | 04                               | 02                       | 06        | 80                         | 20 | -  | -          | 50 E       |
| 31                | Civil Engineering Project I            | CEG501        | GCPI                | 5     | -                    | -                                | 02                       | 02        | -                          | -  |    | -          | 50 I       |
| 32                | Internship-I ( 4 WEEKS)                | CCG502        | GINO                | 5     | -                    | -                                | -                        | 03        | -                          | -  | -  | 50 E       | -          |
| 33                | Elective-2 <from list of options>      | CEG406 to 409 | -                   | 4     | -                    | 03                               | 02                       | 05        | 80                         | 20 |    | -          | 25I        |
| <b>TOTAL</b>      |  |               |                     |       |                      |                                  |                          | <b>32</b> | <b>500</b>                 |    |    | <b>100</b> | <b>175</b> |
| <b>Semester 6</b> |  |               |                     |       |                      |                                  |                          |           |                            |    |    |            |            |
| 34                | Design & Drafting of R.C.C. Structures | CEG402        | GRCC                | 4     | CEG307               | 04                               | 02                       | 06        | 80                         | 20 | -  | -          | 50 E       |
| 35                | Estimating and Costing                 | CEG404        | GEAC                | 4     | CEG303               | 04                               | 04                       | 08        | 80                         | 20 | -  | -          | 75 E       |
| 36                | Civil Engineering Project II           | CEG502        | GCPII               | 5     | CEG501               | -                                | 04                       | 04        | -                          | -  | -  | -          | 100E       |
| 37                | Construction Management                | CEG503        | GCNM                | 5     | -                    | 03                               | -                        | 03        | 80                         | 20 | -  | -          | -          |
| 38                | Irrigation Engineering                 | CEG506        | GIRE                | 5     | -                    | 03                               | 01                       | 04        | 80                         | 20 | -  | -          | 25 E       |
| 39                | Elective-3 <from list of options>      | CEG507 to 510 | -                   | 5     | -                    | 03                               | 00                       | 03        | 80                         | 20 | -  | -          | -          |
| 40                | Internship-II ( 3 WEEKS)               | CCG503        | GINT                | 5     | -                    | -                                | -                        | 02        | -                          | -  | -  | 50 E       | -          |
| 41                | Indian constitution                    | CCG206        | GINC                | 2     | -                    | 02                               | -                        | 00        | -                          | -  | -  | -          | -          |
| 42                | Entrepreneurship & Start-ups           | CEG501        | GESU                | 5     | -                    | 02                               | 02                       | 04        | -                          | -  | -  | -          | 50 I       |
| <b>TOTAL</b>      |  |               |                     |       |                      |                                  |                          | <b>34</b> | <b>500</b>                 |    |    | <b>50</b>  | <b>300</b> |

**Path-2: Students admitted Directly to Second Year**

| SR NO             | Name of Course                          | Course Code   | Course Abbreviation | Level | Pre-requi-site Course | Teaching Scheme (hours per week) |                          |           | Examination Scheme (Marks) |    |    |            |            |
|-------------------|---|---------------|---------------------|-------|-----------------------|----------------------------------|--------------------------|-----------|----------------------------|----|----|------------|------------|
|                   |   |               |                     |       |                       | Th                               | Pract. / Drg. / Tutorial | Credits   | Th                         | TS | TW | Pr         | Or         |
| <b>Semester 3</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 1                 | Applied Mathematics                     | CEG301        | GAMT                | 3     | CCG105<br>CCG106      | 03                               | 01                       | 04        | 80                         | 20 | -  | -          | -          |
| 2                 | Building Construction                   | CEG302        | GBCO                | 3     | -                     | 04                               | 02                       | 06        | 80                         | 20 | -  | -          | 75E        |
| 3                 | Building Drawing                        | CEG303        | GBDR                | 3     | CCG107<br>CCG108      | 02                               | 04                       | 06        | 80                         | 20 | -  | -          | 75E        |
| 4                 | Soil Mechanics & Foundation Engineering | CEG305        | GSMF                | 3     | CCG110                | 03                               | 02                       | 05        | 80                         | 20 | -  | -          | 50 I       |
| 5                 | Mechanics of Structures                 | CEG307        | GMOS                | 3     | CCG110                | 03                               | 02                       | 05        | 80                         | 20 | -  | -          | 50 I       |
| 6                 | Surveying-1                             | CEG308        | GSV1                | 3     | -                     | 03                               | 04                       | 07        | 80                         | 20 | -  | 75 E       | -          |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>33</b> | <b>600</b>                 |    |    | <b>75</b>  | <b>250</b> |
| <b>Semester 4</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 7                 | Surveying- 2                            | CEG309        | GSV2                | 3     | CEG308                | 03                               | 04                       | 07        | 80                         | 20 |    | 75E        | -          |
| 8                 | Transportation Engineering              | CEG310        | GTRE                | 3     | -                     | 04                               | 02                       | 06        | 80                         | 20 |    | -          | 50 I       |
| 9                 | Hydraulics                              | CEG306        | GHYD                | 3     | CCG110                | 04                               | 02                       | 06        | 80                         | 20 |    | -          | 50 E       |
| 10                | Concrete Technology                     | CEG405        | GCTE                | 4     | -                     | 03                               | 02                       | 05        | 80                         | 20 |    | 75 I       | -          |
| 11                | Elective-1 <from list of options>       | CEG311 to 315 | -                   | 3     | -                     | 03                               | 02                       | 05        | 80                         | 20 |    | -          | 25 I       |
| 12                | Essence of Indian Tradition & knowledge | CCG205        | GITK                | 2     | NIL                   | 02                               | 00                       | 00        | -                          | -  | -  | -          | -          |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>29</b> | <b>500</b>                 |    |    | <b>150</b> | <b>125</b> |
| <b>Semester 5</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 13                | Computer Aided drawing                  | CEG304        | GCAD                | 3     | -                     | --                               | 04                       | 04        | --                         | -- |    | 50 I       | --         |
| 14                | Analysis of Structure                   | CEG401        | GAOS                | 4     | CEG307                | 03                               | 01 (T)                   | 04        | 80                         | 20 | -  | -          | -          |
| 15                | Design & Drafting of Steel Structures   | CEG403        | GDSS                | 4     | CEG307                | 03                               | 02                       | 05        | 80                         | 20 | -  | -          | 50 I       |
| 16                | Contracts and Accounts                  | CEG504        | GCAA                | 5     | -                     | 03                               | -                        | 03        | 80                         | 20 | -  | -          | -          |
| 17                | Environmental Engineering               | CEG505        | GENE                | 5     | -                     | 04                               | 02                       | 06        | 80                         | 20 | -  | -          | 50 E       |
| 18                | Civil Engineering Project I             | CEG501        | GCPI                | 5     | -                     | -                                | 02                       | 02        | -                          | -  |    | -          | 50 I       |
| 19                | Internship-I ( 4 WEEKS)                 | CCG502        | GINO                | 5     | -                     | -                                | -                        | 03        | -                          | -  | -  | 50 E       | -          |
| 20                | Elective-2 <from list of options>       | CEG406 to 409 | -                   | 4     | -                     | 03                               | 02                       | 05        | 80                         | 20 |    | -          | 25I        |
| <b>TOTAL</b>      |   |               |                     |       |                       |                                  |                          | <b>32</b> | <b>500</b>                 |    |    | <b>100</b> | <b>175</b> |
| <b>Semester 6</b> |   |               |                     |       |                       |                                  |                          |           |                            |    |    |            |            |
| 21                | Design & Drafting of R.C.C. Structures  | CEG402        | GRCC                | 4     | CEG307                | 04                               | 02                       | 06        | 80                         | 20 | -  | -          | 50 E       |
| 22                | Estimating and Costing                  | CEG404        | GEAC                | 4     | CEG303                | 04                               | 04                       | 08        | 80                         | 20 | -  | -          | 75 E       |
| 23                | Civil Engineering Project II            | CEG502        | GCPII               | 5     | CEG501                | -                                | 04                       | 04        | -                          | -  | -  | -          | 100E       |
| 24                | Construction Management                 | CEG503        | GCNM                | 5     | -                     | 03                               | -                        | 03        | 80                         | 20 | -  | -          | -          |

Curriculum MPECS-2020  
Programme: Diploma in CE

|              |                                   |               |      |   |   |    |    |           |            |    |   |           |            |
|--------------|-----------------------------------|---------------|------|---|---|----|----|-----------|------------|----|---|-----------|------------|
| 25           | Irrigation Engineering            | CEG506        | GIRE | 5 | - | 03 | 01 | 04        | 80         | 20 | - | -         | 25 E       |
| 26           | Elective-3 <from list of options> | CEG507 to 510 | -    | 5 | - | 03 | 00 | 03        | 80         | 20 | - | -         | -          |
| 27           | Internship-II ( 3 WEEKS)          | CCG503        | GINT | 5 | - | -  | -  | 02        | -          | -  | - | 50 E      | -          |
| 28           | Indian constitution               | CCG206        | GINC | 2 | - | 02 | -  | 00        | -          | -  | - | -         | -          |
| 29           | Entrepreneurship & Start-ups      | CEG501        | GESU | 5 | - | 02 | 02 | 04        | -          | -  | - | -         | 50 I       |
| <b>TOTAL</b> |                                   |               |      |   |   |    |    | <b>34</b> | <b>500</b> |    |   | <b>50</b> | <b>300</b> |



## EXEMPTIONS FOR COURSES

### Eligibility for Exemptions for First and Second Semester Courses of MPECS-2020 for students admitted on X-pass basis

| S<br>N | Name of Course                           | Course<br>Code | Whether eligible for exemption ?<br>( Yes / No ) |              |             |             |     |
|--------|--|----------------|--|--------------|-------------|-------------|-----|
|        |  |                | XII<br>Science                                   | XII<br>Tech. | XII<br>MCVC | XII<br>Voc. | ITI |
| 1      | Engineering Physics<br>(CE/ME/MT)        | CCG101         | YES  | YES          | No          | No          | No  |
| 2      | Engineering Physics<br>(EE/IE/ET/IT)     | CCG102         | YES  | YES          | No          | No          | No  |
| 3      | Engineering Chemistry<br>(CE/ME/MT)      | CCG103         | No   | No           | No          | No          | No  |
| 4      | Engineering Chemistry<br>(EE/IE/ET/IT)   | CCG104         | No   | No           | No          | No          | No  |
| 5      | Basic Mathematics                        | CCG105         | YES  | YES          | No          | YES         | No  |
| 6      | Engineering Mathematics<br>(CE/ME/MT)    | CCG106         | YES  | YES          | No          | YES         | No  |
| 7      | Engineering Drawing -1<br>(CE/ME/MT)     | CCG107         | No   | YES          | No          | No          | No  |
| 8      | Engineering Drawing -2<br>(CE/ME/MT)     | CCG108         | No   | YES          | No          | No          | No  |
| 9      | Engineering Graphics<br>(EE/IT/IE/ET)    | CCG109         | No   | YES          | No          | No          | No  |
| 10     | Applied Mechanics                        | CCG110         | No   | No           | No          | No          | No  |
| 11     | Workshop Practices-1 (CE)                | CCG111         | No   | YES          | YES         | YES         | YES |
| 12     | Workshop Practices-1<br>(ME/MT)          | CCG112         | No   | YES          | YES         | YES         | YES |
| 13     | Workshop Practices (EE)                  | CCG113         | No   | YES          | YES         | YES         | YES |
| 14     | Workshop Practices (IE/ET)               | CCG114         | No   | YES          | YES         | YES         | YES |
| 15     | Workshop Practices -2 (CE)               | CCG115         | No   | YES          | YES         | YES         | YES |
| 16     | Workshop Practices -2 (ME/MT)            | CCF116         | No   | YES          | YES         | YES         | YES |
| 17     | Engineering Mathematics<br>(EE/IE/ET/IT) | CCG118         | YES  | YES          | No          | YES         | No  |
| 18     | Communication Skills in<br>English       | CCG203         | No   | No           | No          | No          | No  |

Note : The above eligibility is subject to condition that the student has secured at least 40 % marks in the respective subject.

Students seeking exemption for any other subjects should contact Academic Coordinator / Controller of Examinations

## 6. COURSE EQUIVALENCE FOR PREVIOUS MPECSs

| S<br>N | MPECS-1994                   | MPECS-2001  | MPECS-2006  | MPECS-2010  | MPECS-2013   | MPECS-2016   | MPECS 2020   |
|--------|------------------------------|---|---|---|--|--|--|
| 1.     | --                           | --  | R 101 Generic Skills  | X 101 Generic Skills  | CCE201 Generic Skills  | CCF201 Generic Skills  | ----   |
| 2.     | 101 Communication Skill – I  | 0101 Communication Skill - I                              | R 102 Communication Skills.   | X 106 Communication Skills.   | CCE202Communication Skills                                   | CCF202Communication Skills                                   | CCG203 Communication Skills                                  |
| 3      | 102 Communication Skill – II | 0102 Communication Skill - II                             | R 102 Communication Skills.   | X 106 Communication Skills.   | CCE202Communication Skills                                   | CCF202Communication Skills                                   | ----   |
| 4      | 103 Applied Physics          | 0103 Applied Physics - I<br>0104 Applied Physics – II     | R 103 Applied Physics - I<br>R 104 Applied Physics – II               | X 102 Basic Physics<br>X 108 Applied Physics                          | CCE101 Engineering Physics<br>CCE101 Engineering Physics     | CCF101 Engineering Physics<br>CCF101 Engineering Physics     | CCG101 Engineering Physics<br>CCG101 Engineering Physics     |
| 5      | 104 Applied Chemistry        | 0105 Applied Chemistry - I<br>0106 Applied Chemistry - II | R 105 Applied Chemistry.<br>R 106 Chemistry of Engineering Materials. | X 103 Applied Chemistry.<br>X 109 Chemistry of Engineering Materials. | CCE103 Engineering Chemistry<br>CCE103 Engineering Chemistry | CCF103 Engineering Chemistry<br>CCF103 Engineering Chemistry | CCG103 Engineering Chemistry<br>CCG103 Engineering Chemistry |
| 6      | 105 Mathematics – I          | 0107 Mathematics - I                                      | R 107 Basic Mathematics.  | X 104 Basic Mathematics.  | CCE105 Basic Mathematics                                     | CCF105 Basic Mathematics                                     | CCG105 Basic Mathematics                                     |
| 7      | 106 Mathematics – II         | 0108 Mathematics - II                                     | R 108 Engineering Mathematics   | XC 110 Engineering Mathematics  | CCE106 Engineering Mathematics                               | CCF106 Engineering Mathematics                               | CCG106 Engineering Mathematics                               |
| 8      | 107 Applied Mechanics I      | 0116 Applied Mechanics                                    | R 112 Applied Mechanics   | X 111 Applied Mechanics   | CCE110 Applied Mechanics                                     | CCF110 Applied Mechanics                                     | CCG110 Applied Mechanics                                     |
| 9      | 108 Introduction to          | 0115 Introduction   | 111Computer   | NIL   | NIL  | NIL  | CCG201 Introduction  |

|    | Computer                     | to Computer                            | Fundamentals Applications      |  |  |  | to IT System                                     |
|----|------------------------------|--|--------------------------------|--|--|--|--|
| 10 | 109 Engineering Drawing – I  | 0109 Engineering Drawing - I           | R 109 Engineering Drawing – I  | X 105 Engineering Drawing - I          | CCE107 Engineering Drawing -I              | CCF107 Engineering Drawing -I              | CCG107 Engineering Drawing –I                    |
| 11 | 110 Engineering Drawing – II | 0110 Engineering Drawing - II          | R 110 Engineering Drawing - II | X 107 Engineering Drawing - II         | CCE108 Engineering Drawing - II            | CCF108 Engineering Drawing - II            | CCG108 Engineering Drawing – II                  |
| 12 | 111 Workshop –I              | 0113 Workshop - I                      | R 113 Workshop Practice – I    | CE 101 Basic Workshop Practice (Civil) | CCE111 Basic Workshop Practice-I (Civil)   | CCF111 Basic Workshop Practice-I (Civil)   | CCG111 Basic Workshop Practice-I (Civil)         |
| 13 | 112 Workshop – II            | 0114 Workshop - II                     | R 114 Workshop Practice - II   | CE 102 Basic Workshop Practice (Civil) | CCE115 Basic Workshop Practice -II (Civil) | CCF115 Basic Workshop Practice -II (Civil) | CCG115 Basic Workshop Practice -II (Civil)       |
| 14 | NIL                          | NIL                                    | NIL                            | NIL                                    | NIL  | NIL  | CCG117 Sports & Yoga                             |
| 15 | NIL                          | 0111 Fundamentals of Engineering – I.  | NIL                            | NIL                                    | NIL  | NIL  | CCG202 Fundamentals of Elect. & Electronics Engg |
| 16 | NIL                          | 0112 Fundamentals of Engineering – II. | NIL                            | NIL                                    | NIL  | NIL  | CCG202 Fundamentals of Elect. & Electronics Engg |
| 17 | 201 Mathematics-III          | 1201 Mathematics-III                   | C201 Applied Mathematics       | CE201 Applied Mathematics              | CEE301 Applied Mathematics                 | CEF301 Applied Mathematics                 | CEG301 Applied Mathematics                       |
| 18 | C202 Civil Engg. Drawing     | 1202 @ Civil Engg. Drawing             | C202 Building Drawing          | CE 202 Building Drawing                | CEE303 Building Drawing                    | CEF303 Building Drawing                    | CEG303 Building Drawing                          |
| 19 | C203 Building Drawing        | 1203 Building Drawing                  | C202 Building Drawing          | CE 202 Building Drawing                | CEE303 Building Drawing                    | CEF303 Building Drawing                    | CEG303 Building Drawing                          |
| 20 | --                           | --                                     | C203 @ Civil                   | CE 203 @ Civil                         | NIL  | NIL  | NIL  |

## Programme: Diploma in CE

|    |   |   | Engg. Drawing                               | Engg. Drawing  |  |  |  |
|----|---|---|---|--|--|--|--|
| 21 | C204 Surveying – I                              | 1204 Surveying - I                        | C204 Surveying – I                          | CE 204 Surveying – I                                   | CEE308 Surveying –1                                    | CEF308 Surveying – 1                                   | CEG308 Surveying – 1                                   |
| 22 | C205 Surveying – II                             | 1205 Surveying - II                       | C205 Surveying – II                         | CE 205 Surveying – II                                  | CEE309 Surveying – 2                                   | CEF309 Surveying – 2                                   | CEG309 Surveying – 2                                   |
| 23 | C206 Construction Technology                    | 1206 Construction Technology              | C206 Construction Technology                | CE 206 Construction Technology                         | CEE302 Building Construction                           | CEF302 Building Construction                           | CEG302 Building Construction                           |
| 24 | C207 Concrete Technology<br>C211 Soil Mechanics | 1207 Concrete Technology & Soil Mechanics | C207 Concrete Technology and Soil Mechanics | CE 207 Concrete Technology                             | CEE406 Concrete Technology                             | CEF406 Concrete Technology                             | CEG405 Concrete Technology                             |
| 25 | C216 Roads & Bridges<br>C212 Railways & Tunnel  | 1208 Transportation Engg. (RBR)           | C208 Transportation Engg. (RBR)             | CE 208 Transportation Engg.                            | CEE310 Transportation Engg                             | CEF310 Transportation Engg                             | CEG310 Transportation Engg                             |
| 26 | C401@ Computer Programming                      | 1209@ Computer Programming                | NIL   | NIL  | NIL  | NIL  | NIL  |
| 27 | NIL   | NIL                                       | C210 Personality Development                | NIL  | NIL  | NIL  | NIL  |
| 28 | C213 Construction Techniques                    | 1211 Construction Techniques              | C 211 Construction Techniques               | CE 211 Advanced Construction Techniques and equipments | CEE311 Advanced Construction Techniques and equipments | CEF311 Advanced Construction Techniques and equipments | CEG311 Advanced Construction Techniques and equipments |
| 29 | C214 Construction Equipment's                   | 1212 Construction Equipments              | C212 Construction Equipment's               | CE 211 Advanced Construction Techniques and equipments | CEE311 Advanced Construction Techniques and equipments | CEF311 Advanced Construction Techniques and equipments | CEG311 Advanced Construction Techniques and equipments |
| 30 | NIL   | NIL                                       | C213 Advanced construction materials        | CE 213 Advanced construction materials                 | CEE312 Advanced Construction Materials                 | CEF312 Advanced Construction Materials                 | CEG312 Advanced Construction Materials                 |

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|----|---|---|---|--|---|---|---|
| 31 | C215 Rural Engineering                    | 1213 Rural Engineering                    | NIL                                       | NIL  | NIL   | NIL   | NIL   |
|    | C221 Basic Civil Engineering.(C)          | 0221 Elements of Civil Engineering.(C)    | R221 Elements of Civil Engineering.(C)    | NIL  | NIL   | NIL   | NIL   |
| 32 | C228 Higher Mathematics                   | 0228 Higher Mathematics                   | NIL                                       | NIL  | CEE313 Higher Mathematics                           | CEF313 Higher Mathematics                           | CEG313 Higher Mathematics                           |
| 33 | NIL                                       | NIL                                       | R228 Higher Mathematics                   | NIL  | CEE313 Higher Mathematics                           | CEF313 Higher Mathematics                           | CEG313 Higher Mathematics                           |
| 34 | NIL                                       | NIL                                       | NIL                                       | CE212 Maintenance and Rehabilitation of Structures | CEE314 Maintenance and Rehabilitation of Structures | CEF314 Maintenance and Rehabilitation of Structures | CEG314 Maintenance and Rehabilitation of Structures |
| 35 | NIL                                       | NIL                                       | NIL                                       | NIL  | CCE203 Professional Practices                       | CCF203 Professional Practices                       | NIL   |
| 36 | NIL                                       | NIL                                       | NIL                                       | NIL  | CCE204 Environmental Studies                        | NIL   | NIL   |
| 37 | C301 Mechanics of Structures              | 1301 Mechanics of Structures              | C301 Mechanics of Structures              | CE 210 Mechanics of Structures                     | CEE307 Mechanics of Structures                      | CEF307 Mechanics of Structures                      | CEG307 Mechanics of Structures                      |
| 38 | C302 Analysis of Structures               | 1302 Analysis of Structures               | C302 Analysis of Structures               | CE 301 Analysis of Structures                      | CEE401 Analysis of Structures                       | CEF401 Analysis of Structures                       | CEG401 Analysis of Structures                       |
| 39 | C303 Design & Drafting of RCC Structures. | 1303 Design & Drafting of RCC Structures. | C303 Design & Drafting of RCC Structures. | CE 302 Design & Drafting of RCC Structures.        | CEE402 Design & Drafting of RCC Structures.         | CEF402 Design & Drafting of RCC Structures.         | CEG402 Design & Drafting of RCC Structures.         |
| 40 | C304 Quantity Surveying & Valuation       | 1304 Quantity Surveying & Valuation       | C304 Estimating & Costing .               | CE 303 Estimating & Costing .                      | CEE404 Estimating & Costing .                       | CEF404 Estimating & Costing .                       | CEG404 Estimating & Costing .                       |
| 41 | C314 Hydraulics                           | 1305 Hydraulics                           | C305                                      | CE 304   | CEE 306   | CEF 306 Hydraulics                                  | CEG306 Hydraulics                                   |

|    |  |  | Hydraulics  | Hydraulics  | Hydraulics  |  |  |
|----|--|--|---|---|---|--|--|
| 42 | NIL  | NIL  | C306@ Career & Entrepreneurship Development                   | CE 305@ Personality and Entrepreneurship Development            | NIL   | NIL  | CCG501 Entrepreneurship & Starts up  |
| 43 | C311 Town & Country Planning.                                    | 1311 Town & Country Planning.                                    | C311 Town & Country Planning.                                 | CE 307 Town & Country Planning.                                 | CEE410 Town & Country Planning.                                 | CEF410 Town & Country Planning.  | CEG409 Town & Country Planning.  |
| 44 | NIL  | NIL  | NIL   | CE 308 Building Services  | CEE407 Building Services  | CEF407 Building Services   | CEG406 Building Services   |
| 45 | C312 Foundation Engg.  | 1312 Foundation Engg.  | C312 Foundation Engg.   | CE 306 Soil Mechanics and Foundation Engg.                      | CEE305 Soil Mechanics and Foundation Engg.                      | CEF305 Soil Mechanics and Foundation Engg.   | CEG305 Soil Mechanics and Foundation Engg.   |
| 46 | C313 Design & Drafting of Steel Structures                       | 1313 Design & Drafting of Steel Structures                       | C313 Design & Drafting of Steel Structures                    | CE 309 Design & Drafting of Steel Structures                    | CEE403 Design & Drafting of steel Structures                    | CEF403 Design & Drafting of steel Structures   | CEG403 Design & Drafting of steel Structures   |
| 47 | C315 Irrigation Engg.  | 1401 Irrigation Stru. & System.                                  | C401 Irrigation Stru. & System.                               | CE 401 Irrigation Stru.& System.                                | CEE506 Irrigation Engg.   | CEF507 Irrigation Engg.  | CEG506 Irrigation Engg.  |
| 48 | C403 Construction Management                                     | 1402 Construction Management                                     | C402 Construction Management                                  | CE402 Construction Management                                   | CEE504 Construction Management                                  | CCF501 Industrial Organization & Management  | CEG503 Construction Management   |
| 49 | C404 Environmental Engg.   | 1403 Environmental Engg.   | C403 Environmental Engg.                                      | CE403 Environmental Engg.                                       | CEE505 Environmental Engg.                                      | CEF506 Environmental Engg.   | CEG506 Environmental Engg.   |
| 50 | C305@ Project work & seminar (Flexibility in choice of project). | 1404@ Project work & seminar (Flexibility in choice of project). | C404@ Civil Engg. Project (Flexibility in choice of project). | CE 404@ Civil Engg. Project (Flexibility in choice of project). | CEE502@ Civil Engg. Project (Flexibility in choice of project). | CEF501 Civil Engg. Project I<br>CEF502 Civil Engg. Project II (Flexibility in choice | CEG501 Civil Engg. Project I<br>CEG502 Civil Engg. Project II (Flexibility in choice |

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|    |  |                                     | project).                              |  |   | of project).                               | of project).                              |
| 51 | NIL                                    | NIL                                 | C405@<br>Professional<br>Practices     | CE 405@<br>Professional<br>Practices     | CEE405<br>@Professional<br>Practices(Civil) | CEF405<br>Professional<br>Practices(Civil) | NIL                                       |
| 52 | NIL                                    | NIL                                 | C414Solid<br>waste<br>management       | CE408Solid<br>waste<br>management        | CEE509Solid<br>waste<br>management          | CEF510Solid waste<br>management            | CEG510Solid waste<br>management           |
| 53 | NIL                                    | 1417Earthquake<br>Engineering       | C416Earthquak<br>e<br>Engineering      | CE410Earthqua<br>ke<br>Engineering       | CEE507Earthqua<br>ke<br>Engineering         | CEF508Earthquake<br>Engineering            | CEG508Earthquake<br>Engineering           |
| 54 | C402Computer<br>Application            | 1405@Computer<br>Application – II   | C209@ Cad in<br>Civil<br>Engineering   | CE 209@ Cad<br>in Civil<br>Engineering   | CEE304Compute<br>r Aided Drg.               | CEF304 Computer<br>Aided Drg.              | CEG304 Computer<br>Aided Drg.             |
| 55 | C411<br>Env .Pollution<br>& Control.   | 1411Env.Pollution<br>&<br>Control.  | NIL                                    | NIL                                      | NIL   | NIL  | NIL                                       |
| 56 | C412 Water<br>Management               | 1412 Water<br>Management            | C413WaterShe<br>d<br>Management        | CE407WaterSh<br>ed<br>Management         | CEE510WaterShe<br>d<br>Management           | CEF511WaterShed<br>Management              | CEG511WaterShed<br>Management             |
| 57 | C413 Project<br>Management             | 1413 Project<br>Management          | C406 Contracts<br>and<br>Accounts      | CE 406<br>Contracts<br>and Accounts      | CEE501Contracts<br>and Accounts             | CEF504Contracts<br>and Accounts            | CEG504Contracts<br>and Accounts           |
| 58 | C414 Industrial<br>Waste<br>Management | 1414 Industrial<br>Waste Management | C417 Industrial<br>Waste<br>Management | CE 411<br>Industrial Waste<br>Management | CEE508<br>Industrial Waste<br>Management    | CEF509 Industrial<br>Waste Management      | CGF509 Industrial<br>Waste Management     |
| 59 | C415 Quality<br>Control                | 1415 Quality<br>Control             | C415 Quality<br>Control                | CE 409 Quality<br>Control                | CEE 409 Quality<br>Control                  | CEF 409 Quality<br>Control                 | CEG408 Quality<br>Control                 |
| 60 | C416<br>Entrepreneurship               | 1416<br>Entrepreneurship            | NIL                                    | NIL                                      | NIL   | NIL  | CEG501<br>Entrepreneurship &<br>Start ups |
| 61 | NIL                                    | NIL                                 | NIL                                    | NIL                                      | CEE408<br>Plumbing<br>Services              | CEF408 Plumbing<br>Services                | CEF407 Plumbing<br>Services               |

## Programme: Diploma in CE

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|----|-----|-----|-----|-----|--|---|---|
| 62 | NIL | NIL | NIL | NIL | CEE503@<br>Construction<br>Field<br>Skills | CEF503@<br>Construction Field<br>Skills               | NIL   |
| 63 | NIL | NIL | NIL | NIL | NIL  | CEF 315 Energy<br>Conervation<br>& Audit ( Elective ) | CEF 315 Energy<br>Conervation<br>& Audit ( Elective ) |



**PROFORMA - I**

**GOVERNMENT POLYTECHNIC, KOLHAPUR**  
**Performance for Final Assessment of PRACTICAL /ORAL**  
**FOR COURSES OF FIRST AND SECOND SEMESTER (Without Micro-Projects)**  
**By Internal & External Examiner**  
**(For Coursehaving ONLY PRACTICAL / ORAL)**

Course Code & Course Name:\_\_\_\_\_

Programme:\_\_\_\_\_

Summer/Winter Exam-20\_\_\_\_\_ Date:\_\_\_\_\_

| Sr. No. | Roll No./ Exam.seat No. | Marks of Progressive Skill Test | Marks of Continuous Assessment | Performance of Term End PR/OR by Internal Examiner | Performance of Term End PR/OR by External Examiner | Marks Out of (Total of Col.2 to 5) | Marks As per Evaluation Scheme(as mention in exam.Scheme) |
|---------|-------------------------|---------------------------------|--------------------------------|--|--|------------------------------------|---|
|         | Column No-1             | 2                               | 3                              | 4  | 5  | 6                                  | 7   |
|         | Max.Marks Allotted      | 25                              | 25                             | 25   | 25   | 100                                |   |
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**Internal Examiner**  
**Signature:-**  
**Name:-**  
**Institute:-**

**External Examiner**  
**Signature:-**  
**Name:-**  
**Institute:-**

**PROFORMA-II**  
**GOVERNMENT POLYTECHNIC, KOLHAPUR**  
**Performance for Final Assessment of PRACTICAL /ORAL**  
**FOR COURSES OF FIRST AND SECOND SEMESTER (Without Micro-Projects)**  
**By Internal Examiner**  
**(For Course having ONLY PRACTICAL / ORAL)**

Course Code & Course Name:- \_\_\_\_\_  
 Programme:- \_\_\_\_\_  
 Summer/Winter Exam-20 \_\_\_\_\_ Date:- \_\_\_\_\_

| Sr. No. | Roll No./ Exam.seat No. | Marksof Progressive SkillTest | Marksof Continuous Assessment | Performance ofTermEnd PR/ORbyInternal Examiner | Marks out of (Total of Col.2 to 4) | Marks AsperEvaluation Scheme(as mention in exam.Scheme) |
|---------|-------------------------|-------------------------------|-------------------------------|--|------------------------------------|---|
|         | Column No-1             | 2                             | 3                             | 4  | 5                                  | 6   |
|         | Max.Marks Allotted      | 25                            | 25                            | 50   | 100                                |   |
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**Internal Examiner**  
**Signature:-**  
  
**Name:-**  
**Institute:-**

**PROFORMA - III**  
**GOVERNMENT POLYTECHNIC, KOLHAPUR**  
**Performance for Final Assessment of PRACTICAL /ORAL**  
**FOR COURSES OF THIRD TO SIXTH SEMESTER (With Micro-Projects)**  
**By Internal & External Examiner**  
(For Coursehaving ONLY PRACTICAL / ORAL)

Course Code & Course Name:- \_\_\_\_\_

Programme:- \_\_\_\_\_

Summer/Winter Exam-20 \_\_\_\_\_ Date:- \_\_\_\_\_

| Sr. No. | Roll No./ Exam.seat No. | Marks of Progressive Skill Test | Marks of Continuous Assessment | Marks As per Evaluation Scheme for micro-project (to be assessed by internal examiner) | Performance of Term End PR/OR by Internal Examiner | Performance of Term End PR/OR by External Examiner | Marks Out of (Total of col.2 to 6) | Marks As per Evaluation Scheme (as mention in exam.Scheme) |
|---------|-------------------------|---------------------------------|--------------------------------|--|--|--|------------------------------------|--|
|         | Column no.1             | 2                               | 3                              | 4  | 5  | 6  | 7                                  | 8  |
|         | Max.Marks Allotted      | 25                              | 25                             | 25   | 25   | 25   | 125                                |  |
|         |                         |                                 |                                |  |  |  |                                    |  |
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**Internal Examiner**  
**Signature:-**  
**Name:-**  
**Institute:-Institute:-**

**External Examiner**  
**Signature:-**  
**Name:-**

**PROFORMA–IV**  
**GOVERNMENT POLYTECHNIC, KOLHAPUR**  
**Performance for Final Assessment of PRACTICAL / ORAL**  
**FOR COURSES OF THIRD TO SIXTH SEMESTER (With Micro-Projects)**  
**By Internal Examiner**  
 (For Coursehaving ONLY PRACTICAL / ORAL)

Course Code & Course Name:- \_\_\_\_\_

Programme:- \_\_\_\_\_

Summer/Winter Exam-20 \_\_\_\_\_ Date:- \_\_\_\_\_

| Sr. No. | Roll No./ Exam.seat No. | Marksof Progressive SkillTest | Marksof Continuous Assessment | Marks As per Evaluation Scheme for micro-project (to be assessed by internal examiner) | Performance OfTermEnd PR/ORbyIntern al Examiner | Marks out of (Total of col.2 to 5) | Marks As per Evaluation Scheme (as mention in exam.Scheme) |
|---------|-------------------------|-------------------------------|-------------------------------|--|---|------------------------------------|--|
|         | Column no.1             | 2                             | 3                             | 4  | 5   | 6                                  | 7  |
|         | Max.Marks Allotted      | 25                            | 25                            | 25   | 50  | 125                                |  |
|         |                         |                               |                               |  |   |                                    |  |
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**Internal Examiner**  
**Signature:-**  
**Name:-**  
**Institute:-**

# **SECTION –II**

## **Syllabi of Courses Level-Wise**

# **LEVEL I – FOUNDATION COURSES**

**COURSE ID :**

**Course Name : ENGINEERING PHYSICS (CE/ME/MT)**  
**Course Code : CCG101**  
**Course Abbreviation : GPHA**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : Nil**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme**

| Component | Progressive Assessment                |                            |                            | Semester end        |                          | Total |
|-----------|---------------------------------------|----------------------------|----------------------------|---------------------|--------------------------|-------|
|           | Theory                                | Practical*                 |                            | Theory              | Practical*               |       |
| Duration  | Average of two tests of 20 marks each | Practical assignment (CA)* | One Skill Test (2 hours) * | One paper (3 hours) | One practical (2 hours)* |       |
| Marks     | 20                                    | 25                         | 25                         | 80                  | 50 I                     | 150   |

\* Assessment as per pro-forma II

I – Internal Examination

**RATIONALE :**

Physics is the foundation of engineering and technology. The development of all engineering areas requires good understanding of fundamental principles in physics. Studying physics develops scientific methodology and technical aptitude in the students. Applications of principles of physics in engineering fields create interest and motivate the students.

**COMPETENCY :**

Apply principles of Physics to solve engineering problems as follows:

**Cognitive** : i) Understanding and applying principles and laws of Physics to simple practical Problems/situations. ii) Observing iii) Classifying iv) Interpreting

**Psychomotor** : Handling of instruments, apparatus and tools

**Affective** : Skill of i) working in team ii) curiosity, interest and self-confidence

**COURSE OUTCOMES :**

**CCG101-1** Estimate errors in measurement of physical quantities.

**CCG101-2** Select proper material in engineering industry by analysis of its physical properties

**CCG101-3** Use basic principles of wave motion for related engineering applications

**CCG101-4** Apply principles of optics, electricity to solve engineering problems

**CCG101-5** Express importance of Lasers, X-rays and nanotechnology.

**CCG101-6** Apply principles of acoustics and ultrasonics for related engineering applications

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ **Note : Correlation levels** : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | PO 1<br>Basic and discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>design/ development of solutions | PO 4<br>Engineering Tools, experimentation and testing | PO 5<br>Engineering practice for society, sustainability and environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1 | PSO2 |
|---|---|--------------------------|--|--|--|----------------------------|----------------------------|------|------|
| <i>Competency: Apply principles of Physics to solve engineering problems.</i>                         | 3   | 1                        | 1  | 2  | 1  | 1                          | 2                          |      |      |
| <b>CCG101-1</b> Estimate errors in measurement of physical quantities.                                | 3   | 1                        | 1  | 2  | -  | 1                          | 2                          |      |      |
| <b>CCG101-2</b> Select proper material in engineering industry by analysis of its physical properties | 3   | 1                        | 1  | 2  | 1  | 1                          | 2                          |      |      |
| <b>CCG101-3</b> Use basic principles of wave motion for related engineering applications              | 3   | 1                        | 1  | 2  | 1  | 1                          | 2                          |      |      |



| Competency and COs  | PO 1<br>Basic and discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>design/ development of solutions | PO 4<br>Engineering Tools, experimentation and testing | PO 5<br>Engineering practice for society, sustainability and environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1 | PSO2 |
|---|---|--------------------------|--|--|--|----------------------------|----------------------------|------|------|
| CCG101-4 Apply principles of optics, electricity to solve engineering problems              | 3   | 1                        | 2  | 2  | 2  | 1                          | 2                          |      |      |
| CCG101-5 Express the importance of Lasers, X-rays and nanotechnology.                       | 3   | 1                        | 1  | 1  | 2  | 1                          | 1                          |      |      |
| CCG101-6 Apply principles of acoustics and ultrasonics for related engineering applications | 3   | 1                        | 1  | 1  | 1  | 1                          | 2                          |      |      |

**CONTENT :**

**A) LABORATORY WORK :** Laboratory work shall consist of the following :

Minimum 10 required (\* represents as experiments to be carried out compulsory and 02 experiments should be from the remaining list )

**List of Laboratory experiments and related skills to be developed: ( Each experiment 02 hours)**

| Sr. No. | Title of Experiment   | Skills to be developed  | Course Outcome |
|---------|---|---|----------------|
| *1      | To measure internal and external dimensions of hollow cylinder by using Vernier Caliper | i) Going through safety measures required<br>ii) Determine least count and zero error in the measuring instrument.<br>iii) Measuring internal and external dimensions of given objects<br>iv) Handling the measuring instruments for measuring depth, thickness etc.<br>v) Tabulating observations and calculations<br>vi) Interpreting results | CCG101-1       |
| *2      | To measure the diameter of bob and thickness of plate by using Vernier Caliper          | i) Going through safety measures required<br>ii) Determine least count and zero error in the measuring instrument.<br>iii) Measuring dimensions of given objects<br>iv) Handling the measuring instruments for measuring depth, thickness etc.<br>v) Tabulating observations and calculations<br>vi) Interpreting results                       | CCG101-1       |

|    |   |   |          |
|----|---|---|----------|
| *3 | To measure the diameter of bob and thickness of plate by using Micrometer screw gauge | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Determine least count and zero error in the measuring instrument.</li> <li>iii) Measuring dimensions of given objects</li> <li>iv) Handling the measuring instruments for measuring depth, thickness etc.</li> <li>v) Tabulating observations and calculations</li> <li>vi) Interpreting results</li> </ul>   | CCG101-1 |
| *4 | To determine the viscosity of liquid by Stokes method.                                | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Measuring diameter of steel ball using micrometer screw gauge.</li> <li>iii) Measuring terminal velocity of steel ball in the liquid column.</li> <li>iv) Use of stop watch for measurement of time.</li> <li>v) Tabulating observations and calculations</li> <li>vi) Interpreting results</li> </ul>  | CCG101-2 |
| 5  | To determine the buoyancy force on a solid immersed in a liquid                       | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Measuring dimensions of given solid using vernier caliper or micrometer screw gauge.</li> <li>iii) Measuring the volume of liquid collected</li> <li>iv) Tabulating observations and calculations</li> <li>v) Interpreting results</li> </ul>   | CCG101-2 |
| *6 | To measure unknown resistance of wire by Ammeter – Voltmeter method.                  | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Drawing the circuit diagram of the required experiment.</li> <li>iii) Connecting the instruments as per circuit diagram.</li> <li>iv) Measuring the value of potential difference &amp; current in the circuit.</li> <li>v) Tabulating observations and calculations</li> <li>vi) Interpreting results</li> </ul>                                     | CCG101-4 |
| *7 | To verify Snell's law using glass slab  | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Drawing necessary ray diagram</li> <li>iii) Measuring angles of incidence and refraction</li> <li>iv) Tabulating observations and calculations</li> <li>v) Interpreting results</li> </ul>  | CCG101-4 |
| *8 | To determine refractive index of prism by pin method                                  | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Removing parallax between images and pins</li> <li>iii) Measuring the angle of refraction correctly</li> <li>iv) Drawing path of refracted ray through prism</li> <li>v) Drawing <math>i-\delta</math> graph</li> <li>vi) Tabulating observations and calculations</li> <li>vi) Interpreting results</li> </ul>                                       | CCG101-4 |
| 9  | To study Total Internal Reflection using glass slab                                   | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Drawing necessary ray diagram</li> <li>iii) Measuring angles of incidence and refraction</li> <li>iv) Tabulating observations and calculations</li> <li>v) Interpreting results</li> </ul>  | CCG101-4 |
| 10 | To determine velocity of sound by resonance tube                                      | <ul style="list-style-type: none"> <li>i) Going through safety measures required</li> <li>ii) Adjusting the resonating length by discriminating resonating sound from sound produced by the tuning fork.</li> <li>iii) Measuring internal diameter of resonating tube using vernier caliper</li> <li>iii) Drawing inference &amp; confirming Law <math>nL = \text{constant}</math></li> <li>iv) Tabulating observations and calculations</li> </ul> | CCG101-3 |

|     |  |   |          |
|-----|--|---|----------|
|     |  | v) Interpreting results   |          |
| 11  | To determine the acceleration due to gravity by 'g' by simple pendulum | i) Going through safety measures required<br>ii) Measuring length of pendulum<br>iii) Finding least count of stopwatch<br>iii) Measuring periodic time with the help of stop watch<br>iv) Tabulating observations and calculations<br>v) Interpreting results   | CCG101-3 |
| *12 | To measure unknown resistance by Wheatstone's meter bridge.            | i) Going through safety measures required<br>ii) Drawing the circuit diagram for the experiment<br>iii) Connecting the resistances as per circuit diagram.<br>iii) Finding the correct position of null point & measuring correct balancing lengths on Meter bridge.<br>iv) Tabulating observations and calculations<br>v) Interpreting results   | CCG101-4 |
| 13  | To verify series law of resistances by Wheatstone's meter bridge.      | i) Going through safety measures required<br>ii) Drawing the circuit diagram for series connections of the resistances.<br>iii) Connecting the resistances for series method as per circuit diagram.<br>iii) Finding the correct position of null point & measuring correct balancing lengths on Meter bridge.<br>iv) Tabulating observations and calculations<br>v) Interpreting results     | CCG101-4 |
| 14  | To parallel law of resistances by Wheatstone's meter bridge.           | i) Going through safety measures required<br>ii) Drawing the circuit diagram for parallel connections of the resistances.<br>iii) Connecting the resistances for parallel method as per circuit diagram.<br>iii) Finding the correct position of null point & measuring correct balancing lengths on Meter bridge.<br>iv) Tabulating observations and calculations<br>v) Interpreting results | CCG101-4 |
| 15  | To be added by the subject teacher as per requirement                  |   |          |

**THEORY :**

**Section I**

| Sr. No.  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|--|---|------------------|---------------------------|
| <i>Course Outcome CCG101-1 Estimate errors in measurement in Physical quantities</i> |   |                  |                           |
| 1  | <b>UNITS AND MEASUREMENT</b><br>1.1 Unit, Physical Quantities : Fundamental and Derived Quantities and their units<br>1.2 Systems of units : CGS, MKS, FPS and SI<br>1.3 Errors , Types of errors : Instrumental, Systematic and Random error, Estimation of errors : Absolute, Relative and percentage errors<br>1.4 Significant figures<br>1.5 <b>Simple Numerical problems</b> | <b>06</b>        | <b>10</b>                 |

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <i>Course Outcome CCG101-2 Select proper material in engineering industry by analysis of its physical properties</i>  |   |                  |                           |
| 2   | <b>ELASTICITY</b><br>2.1 Definitions of elasticity, plasticity, rigidity, deforming force, restoring force<br>2.2 Stress, Strain and their types<br>2.3 Elastic Limit, Statement of Hooke's law, modulus of elasticity and its types<br>2.4 Relation between Y, K and $\eta$ (No derivation)<br>2.5 Ultimate stress, breaking stress, Working stress, Factor of safety<br>2.6 Applications of elasticity<br>2.7 <b>Simple Numerical problems</b>  | 06               | 10                        |
| 3   | <b>VISCOSITY</b><br>3.1 Definition and meaning of viscosity, velocity gradient<br>3.2 Newton's law of viscosity, Coefficient of viscosity<br>3.3 Stokes law<br>3.4 Derivation of expression for coefficient of viscosity of liquid by Stokes method<br>3.5 Applications of viscosity.<br><b>No numericals on above topic</b>  | 06               | 08                        |
| <i>Course Outcome CCG101-3 Use basic principles of wave motion for related engineering applications</i>   |   |                  |                           |
| 4   | <b>WAVE MOTION</b><br>4.1 Definitions of periodic motion, Linear S. H. M.<br>4.2 Parameters of linear SHM : Amplitudes, Period, Frequency and Phase<br>4.3 Characteristics of linear SHM<br>4.4 Concept and definition of wave<br>4.5 Parameters of wave- Frequency, periodic time, phase and wavelength<br>4.6 Types of waves (transverse and longitudinal) and their characteristics<br>4.7 Free and forced oscillations<br>4.8 Phenomenon of resonance and its applications<br><b>No numericals on above topic</b> | 06               | 12                        |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |

**Section II**

| Sr. No.  | Topics / Subtopics  | Lectures (Hours)   | Theory Evaluation (Marks)  |
|--|---|--|--|
| <i>Course Outcome CCG101-4 Apply principles of optics, electricity to solve engineering problems</i> |   |  |  |
| 5  | <b>PROPERTIES OF LIGHT</b><br>5.1 Refraction of light<br>5.2 Laws of Refraction of Light, Snell's law<br>5.3 Refraction through glass prism<br>5.4 Derivation of prism formula<br>5.5 Dispersion & Dispersive Power (in terms of angles of deviation only)<br>5.6 Simple Numerical problems   | 06   | 08   |
| 6  | <b>ELECTRICITY</b><br>6.1 Concept of electric current , resistance<br>6.2 Ohm's law, Specific resistance<br>6.3 Resistances in series and parallel.<br>6.4 Wheatstone's Network and Meter Bridge.<br>6.5 Simple Numerical problems  | 06   | 10   |
| <i>Course Outcome CCG101-5 Express the importance of Lasers, X-rays and nanotechnology.</i>          |   |  |  |
| 7  | <b>MODERN PHYSICS</b><br><b>7.1 LASER</b><br>7.1.1 Introduction of LASER<br>7.1.2 Properties of laser<br>7.1.3 Spontaneous and stimulated emission<br>7.1.4 Population inversion and optical pumping<br>7.1.5 Applications of LASER<br>No numericals on above topic<br><br><b>7.2 X-RAYS</b><br>7.2.1 Nature and properties of x-rays.<br>7.2.2 Production of x-rays by Coolidge tube<br>7.2.3 Applications of x-rays<br>No numericals on above topic<br><br><b>7.3 INTRODUCTION TO NANOTECHNOLOGY</b><br>7.3.1 Definition of nanoscale, nanometer, nanoparticle<br>7.3.2 Definition and examples of nanostructured materials<br>7.3.3 Applications of nanotechnology in electronics, automobile, textile, space, medicine, cosmetics and environment<br>No numericals on above topic | 08<br><br><br><br><br><br><br><br><br><br>(03)<br><br><br><br><br><br><br><br><br><br><br>(03)<br><br><br><br><br><br><br><br><br><br><br>(02) | 14<br><br><br><br><br><br><br><br><br><br><br>(06)<br><br><br><br><br><br><br><br><br><br><br>(04)<br><br><br><br><br><br><br><br><br><br><br>(04) |
| <i>Course Outcome CCG101-6 Apply principles of acoustics and ultrasonics for related engineering</i> |   |  |  |

|   |  |           |           |
|---|--|-----------|-----------|
| <i>applications</i>   |  |           |           |
| <b>8</b>  | <b>ACOUSTICS AND ULTRASONICS</b><br><br><b>8.1 ACOUSTICS</b><br>8.1.1 Echo and reverberation of sound<br>8.1.2 Sabine's formula<br>8.1.3 Requirements of good acoustics<br>8.1.4 Acoustical planning of an auditorium<br>8.1.5 <b>Simple Numerical Problems</b><br><br><b>8.2 ULTRASONICS</b><br>8.2.1 Limits of audibility<br>8.2.2 Ultrasonic waves<br>8.2.3 Ultrasonic transducers : Piezoelectric and Magnetostriction<br>8.2.4 Applications of ultrasonic waves<br><b>No numerical on above topic</b> | <b>04</b> | <b>08</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination :**

| Section / Topic no. | Name of topic              | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total marks |
|---------------------|----------------------------|--|------------|-------------|----------------|-------------|
|                     |                            | Remember                                     | Understand | Application |                |             |
| I/1                 | Units and Measurement      | 2  | 4          | 4           | CCG101-1       | 10          |
| I/2                 | Elasticity                 | 2  | 2          | 6           | CCG101-2       | 10          |
| I/3                 | Viscosity                  | 2  | 2          | 4           | CCG101-2       | 08          |
| I/4                 | Wave motion                | 4  | 8          | -           | CCG101-3       | 12          |
| II/5                | Properties of light        | 2  | 2          | 4           | CCG101-4       | 08          |
| II/6                | Electricity                | 2  | 2          | 6           | CCG101-4       | 10          |
| II/7                | Modern Physics             | 4  | 4          | 6           | CCG101-5       | 14          |
| II/8                | Acoustics and Ultrasonic's | 2  | 4          | 2           | CCG101-6       | 08          |
|                     | Total                      | 20   | 28         | 32          |                | 80          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**ASSESSMENT CRITERIA FOR PRACTICAL WORK AND PRACTICAL EXAMINATION**

**a) Assessment Criteria for Practical work :**

**i) Continuous Assessment of Practical Assignments :**

Every practical assignment shall be assessed for 25 marks as per given criteria .

| Domain       | Particulars  | Marks out of 25 |
|--------------|--|-----------------|
| Cognitive    | Understanding  | 05              |
|              | Observations, calculations & Result table              | 05              |
| Psychomotor  | Operating Skills                                       | 05              |
|              | Neat & complete circuit Diagram / schematic Diagram.   | 05              |
| Affective    | Discipline and punctuality<br>Decency and presentation | 5               |
| <b>TOTAL</b> |  | <b>25</b>       |

**ii) Progressive Skill Test :**

One mid-term Progressive Skill Test of 25 marks shall be conducted as per criteria given below

**Criteria for Continuous Assessment of Practical work and Progressive skill Test :**

| Sr. No. | Criteria  | Marks allotted |
|---------|---|----------------|
| 1       | Neat & complete circuit Diagram / schematic Diagram.    | 05             |
| 2       | Observations & Result Table                             | 05             |
| 3       | Sample Calculations with relevant Formulae.             | 05             |
| 4       | Proper Graphs & Procedure / workmanship Safety measures | 05             |
| 5       | Oral Based on Practical Work                            | 05             |
| Total   |   | 25             |

**b) Criteria for assessment at semester end practical exam :**

Every student has to perform one practical within 2 hours at semester end practical exam which shall be assessed as per following criteria.

| Sr. no | Criteria                             | Marks allotted |
|--------|--------------------------------------|----------------|
| 1      | Preparedness for practical           | 10             |
| 2      | Correct figures / diagrams           | 10             |
| 3      | Observation tables                   | 10             |
| 4      | Result table / calculations / graphs | 10             |
| 5      | Safety / use of proper tools         | 10             |
| Total  |                                      | 50             |

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**INSTRUCTIONAL STRATEGIES :****Instructional Methods :**

1. Lectures cum Discussions    2. Regular Home Assignments.    3. Laboratory work

**Teaching and Learning resources:**

1. Chalk board    2. Video clips    3. Slides    4. Item Bank    5. Charts

**REFERENCE MATERIAL :****a) Books / Codes**

| No. | Author                    | Title   | Publisher                         |
|-----|---------------------------|---|-----------------------------------|
| 1.  | Narlikar                  | Text book of Physics for class XI & XII (Part-I, Part-II) | N.C.E.R.T Delhi                   |
| 2.  | P.V.Naik.                 | Engineering Physics                                       | Pearson Edu. Pvt. Ltd, New Delhi. |
| 3   | Narkhede, Pawar, Sutar    | Concepts in Physics, Vol. I & II                          | Bharti Bhawan Ltd, New Delhi.     |
| 4   | Walker, Halliday, Resnick | Principles of Physics.                                    | Wiley Publication. , New Delhi.   |
| 5   | B.L. Theraja              | Engineering Physics                                       | S. Chand Publishers – New Delhi   |
| 6   | Beiser                    | Concept of modern physics                                 | Tata Mc-Graw Hill                 |
| 7   | E. Zebro Wski             | Physics for Technicians                                   | Tata Mc-Graw Hill                 |
| 8   | V. Rajendran              | Engineering Physics                                       | Tata McGraw-Hill Publications     |

**b) Websites**

- i) <http://www.physicsclassroom.com>
- ii) <http://scienceworld.wolfram.com/physics/>
- iii) <http://physics.about.com/>
- iv) <http://nptel.ac.in/course.php?disciplineId=115>
- v) <http://nptel.ac.in/course.php?disciplineId=104>
- vi) [www.fearofphysics.com](http://www.fearofphysics.com)
- vii) [www.science.howstuffworks.com](http://www.science.howstuffworks.com)

\* \* \*



**COURSE ID:**

**Course Name** : ENGINEERING CHEMISTRY. (CE/ME/MT)  
**Course Code** : CCG103  
**Course Abbreviation** : GCHA

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : <nil>

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Component | Progressive Assessment  |                          | Semester end        |                         | Total |
|-----------|-------------------------|--------------------------|---------------------|-------------------------|-------|
|           | Theory                  | Practical                | Theory              | Practical*              |       |
| Duration  | Two tests (1 hour each) | One Skill Test (2 hours) | One paper (3 hours) | One practical (2 hours) |       |
| Marks     | 20 each                 | 25                       | 80                  | 50I                     | 150   |

\* Assessment as per pro-forma II.

I – Internal Examination

**RATIONALE:**

Basic science such as Chemistry is the fundamental of Engineering & technology. It is most essential to learn the basic science to understand the fundamental concepts in Engineering & technology. Engineering chemistry deals with the study of structure, composition & properties of the materials, which form the core of the fundamental science. Many processes are based on principle of Chemistry in various industries. Topics such as Water, Electrochemistry, Corrosion, & protection of metals from corrosion are some of the direct applications of chemistry in engineering. Hence, the knowledge of chemistry is essential to the aspiring engineers of all branches in their field. Engineering materials like Steel, Rubber, Plastic, Thermocole, Glass wool, Paints, Lubricants are the backbone of various industries, machines, equipment & processes.

**COMPETENCY:**

Apply the knowledge of chemistry to use the engineering materials for various purposes depending on their chemical properties.

**Cognitive:** Understanding & applying properties of chemicals in engineering field.

**Psychomotor:** Handling & use of glassware & chemicals.

Sketching & labeling diagram of Blast furnace.

Experimentally analyzing water samples for preparing potable water by different methods.

**Affective:** i) Accuracy ii) Safety iii) Punctuality iv) Attitude.

**COURSE OUTCOMES:**

1. **CCG103-1** Understand the application of basic concepts in chemistry.
2. **CCG103-2** Apply the knowledge of electrochemistry in industry for electroplating and electro-refining.
3. **CCG103-3** Interpret the reasons of corrosion & remedies by using appropriate techniques.
4. **CCG103-4** Select the relevant catalyst for given application.
5. **CCG103-5** Select insulators, adhesive, composite materials, Plastic & rubber for different applications in the field of engineering
6. **CCG103-6** Use relevant water treatment process to solve industry problems.
7. **CCG103-7** Understand the method of extraction of Iron.
8. **CCG103-8** Use appropriate lubricant to solve industrial problems.
9. **CCG103-9** Select paint and varnish for different applications in the field of engineering.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance |
|---|---|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|
| <b>Competency:</b> Apply principles of advanced chemistry to solve engineering problems   | 3   | 3                     | 2                                    | 2   | 1   | 1                       | 1                       | 1                    | 1                                 |
| <b>CCG103-1</b> Understand the application of basic concepts in chemistry.  | 3   | 3                     | 3                                    | 2   | -   | -                       | 1                       | 2                    | 2                                 |
| <b>CCG103-2</b> Apply the knowledge of electrochemistry in industry for electroplating and electro-refining.                              | 3   | 3                     | 2                                    | 3   | 1   | 1                       | 2                       | 2                    | 2                                 |
| <b>CCG103-3</b> Interpret the reasons of corrosion & remedies by using appropriate techniques   | 3   | 3                     | 3                                    | 2   | 2   | 1                       | 1                       | 3                    | 3                                 |
| <b>CCG103-4</b> Select the relevant catalyst for given application.   | 3   | 2                     | 2                                    | 1   | 1   | 1                       | 2                       | 1                    | 1                                 |
| <b>CCG103-5</b> Select insulators, adhesive, composite materials, Plastic & rubber for different applications in the field of engineering | 3   | 2                     | 2                                    | 1   | 2   | 1                       | 1                       | 2                    | 2                                 |
| <b>CCG103-6</b> Use relevant water treatment process to solve industry problems.  | 3   | 3                     | 3                                    | 2   | 2   | 1                       | 1                       | 2                    | 3                                 |
| <b>CCG103-7</b> Understand the method of extraction of Iron.  | 3   | 3                     | 2                                    | 2   | 2   | 1                       | 1                       | 2                    | 2                                 |

| Competency and COs   | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance |
|--|--|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|
| CCG103-8 Use appropriate lubricant to solve industrial problems.                         | 3  | 2                     | 2                                    | 2   | 2   | 1                       | 1                       | 2                    | 2                                 |
| CCG103-9 Select paint and varnish for different applications in the field of engineering | 3  | 2                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 2                                 |

## CONTENT:

### A. LABORATORY WORK

Lab work shall consist of the following:

#### Laboratory experiments and related skills to be developed :

| Sr. No. | Title of Experiment  | Skills/Competencies to be developed   | Course Outcome |
|---------|--|---|----------------|
| 1       | Introduction to Chemistry laboratory   | Awareness of chemicals, glasswares & instruments used in chemistry laboratory   | CCG103-1       |
| 2       | Volumetric analysis of solution.   | Molecular weight, equivalent weight, acidity, basicity normality of solution. Awareness of different types of titrations, use of indicators | CCG103-1       |
| 3       | Preparation of 1 N, 0.5 N & 0.1 N Solutions of different chemicals like NaOH, HCl, Oxalic acid, FeSO <sub>4</sub> , etc.       | Skill of weighing, handling Glassware & measuring solutions   | CCG103-1       |
| 4       | Titration of strong acid and strong bases ( HCl X NaOH)  | Skills of determining accurate end point of titration & development of measurement skills.  | CCG103-1       |
| 5       | Titration of strong acid, strong base & weak acid (HCl X NaOH X H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O | Skills of determining accurate end point of titration & development of measurement skills.  | CCG103-1       |
| 6       | Titration of weak base , strong acid & strong base (Na <sub>2</sub> CO <sub>3</sub> X H <sub>2</sub> SO <sub>4</sub> X KOH     | Skills of determining accurate end point of titration & development of measurement skills.  | CCG103-1       |
| 7       | Estimation of chloride content in water by Mohr' s method  | Measurement skill utilization of practical data for testing & estimation  | CCG103-5       |
| 8       | Determination of amount of Ca and Mg ions present in given sample of water by E.D.T.A method                                   | Measurement skill utilization of practical data for testing & estimation  | CCG103-5       |
| 9       | Estimation of viscosity of oils by Ostwald's method  | Measurement skill utilization of practical data for testing & estimation  | CCG103-1       |

|    |  |  |          |
|----|--|--|----------|
| 10 | Estimation of Ca in limestone.                                   | Measurement skill utilization of practical data for testing & estimation                   | CCG103-5 |
| 11 | Titration of $\text{KMnO}_4$ & $\text{FeSO}_4$ (Redox titration) | Skills of determining accurate end point of titration & development of measurement skills. | CCG103-6 |
| 12 | Estimation of % of Fe in given sample of steel                   | Measurement skill utilization of practical data for testing & estimation                   | CCG103-6 |
| 13 | Determination of alkalinity of water                             | Measurement skill utilization of practical data for testing & estimation                   | CCG103-6 |

## B THEORY:

### Section I

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>CCG103-1</b> Understand the application of basic concepts in chemistry.                                   |  |                  |                           |
| <b>1</b>   | <b>ATOMIC STRUCTURE AND CHEMICAL BONDING</b><br>1.1 Atom :Fundamental particles, Nature of atom<br>1.2 Atomic Number, Mass Number, Isotopes and isobars<br>1.3 Bohr's theory of atom<br>1.4 Statement of Hund's rule of maximum multiplicity,Pauli's exclusion principle<br>Aufbau's principle<br>1.5 Lewis and Langmuir's concept of stable electronic configuration<br>1.6 Electrovalency and Co-valency<br>1.7 Formation Of electrovalent compounds- $\text{NaCl}$ , $\text{CaCl}_2$ .<br>1.8 Formation of Covalent compounds- $\text{H}_2\text{O}$ , $\text{CO}_2$ | <b>05</b>        | <b>08</b>                 |
| <b>CCG103-2</b> Apply the knowledge of electrochemistry in industry for electroplating and electro-refining. |  |                  |                           |
| <b>2</b>   | <b>ELECTROCHEMISTRY</b><br>2.1 Definitions- Conductor, Electrolyte, Electrode, Ionisation, Electrolysis.<br>2.2 Arrhenius Theory Of Ionisation<br>2.3 Degree of Ionisation & Factors affecting degree of ionisation.<br>2.4 Electrolysis of molten $\text{NaCl}$ .<br>2.5 Electrolysis of $\text{CuSO}_4$ solution by using Cu- electrodes<br>2.6 Industrial applications of electrolysis<br>2.6.1 Electroplating<br>2.6.2 Electro refining of Cu  | <b>05</b>        | <b>08</b>                 |
| <b>CCG103-3</b> Interpret the reasons of corrosion & remedies by using appropriate techniques.               |  |                  |                           |
| <b>3.</b>  | <b>CORROSION AND PROTECTIVE COATING</b><br>3.1 Definition & types of corrosion<br>3.2 Dry or Atmospheric corrosion , Oxide Film Formation & its types ,Factors affecting atmospheric corrosion<br>3.3 Wet or electrochemical corrosion<br>3.4 Factors influencing immersed corrosion   | <b>04</b>        | <b>06</b>                 |

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
|   | 3.5 Methods of protection of metal from corrosion - Hot dipping (Galvanizing & Tinning) ,Metal spraying, Metal cladding, Cementation or sherardizing   |                  |                           |
| <b>CCG103-4</b> Select the relevant catalyst for given application.   |  |                  |                           |
| 4   | <b>CATALYSIS</b><br>4.1 Definition.<br>4.2 Types of Catalysts with example.<br>- Homogenous catalyst.<br>- Heterogenous catalyst<br>4.3 Promoters.<br>4.4 Negative catalysis.<br>4.5 Autocatalysis.  | 02               | 04                        |
| <b>CCG103-5</b> Select insulators, adhesive, composite materials, Plastic & rubber for different applications in the field of engineering   |  |                  |                           |
| 5   | <b>CHEMISTRY OF NONMETALLIC ENGINEERING MATERIALS</b><br><b>5.1 INSULATORS</b><br>5.1.1 Definition & Characteristics of insulator<br>5.1.2 Preparation, properties & uses of glass wool, Thermocole.<br><b>5.2 COMPOSITE MATERIALS</b><br>5.2.1 Definition & classification.<br>5.2.2 Properties & Application of composite materials<br><b>5.3 PLASTICS</b><br>5.3.1 Definition of Polymer, Polymerization.<br>5.3.2 Types of polymerization – Addition & Condensation polymerization.<br>5.3.3 Classification of plastic – Thermosoftening & thermosetting plastics.<br>5.3.4 Engineering properties & applications of plastics.<br><b>5.4 RUBBER</b><br>5.4.1 Elastomer<br>5.4.2 Drawbacks of Natural rubber.<br>5.4.3 Vulcanization of rubber.<br>5.4.4 Engineering properties & uses of rubber.<br><b>5.5 ADHESIVES</b><br>5.5.1 Definition of adhesives.<br>5.5.2 Charecteristics of good adhesive.<br>5.5.3 Properties of adhesive. | 08               | 14                        |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                           |

## Section II

| Sr. No.  | Topics / Subtopics   | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>CCG103-6</b> Use relevant water treatment process to solve industry problems. |  |                  |                           |
| <b>6</b>   | <b>WATER</b><br>6.1 Impurities in natural water<br>6.2 Hard water & Soft water<br>6.3 Hardness of water- Temporary & Permanent<br>6.4 Reactions of hard water with soap<br>6.5 Disadvantages of hard water for domestic & Industrial purpose - Textile Industry, Sugar Industry, Paper Industry Dying Industry.<br>6.6 Sterilization of water - Chlorination –by Chlorine gas/water, bleaching powder, chloramine with chemical reactions<br>6.7 Ion Exchange method to remove total hardness of Water   | <b>08</b>        | <b>12</b>                 |
| <b>CCG103-7</b> Understand the method of extraction of Iron.                     |  |                  |                           |
| <b>7</b>   | <b>METALLURGY &amp; ALLOYS</b><br>7.1 Occurance of metals, Definition of minerals, Ore, Flux, Gangue & Slag.<br>7.2 Flow chart of metallurgical processes.<br>7.3 Concentration of ores –<br>Physical methods –<br>1. Gravity separation method<br>2. Electromagnetic separation method<br>3. Froth floation method<br>Chemical methods –<br>1. Calcination<br>2. Roasting<br>7.4 Ores of Iron.<br>7.5 Extraction of Iron from its ore –<br>Blast furnace – Construction, working, reactions & Products.<br>7.6 Definition of alloys<br>7.7 Classification & purposes of making of alloys.<br>7.8 Composition, properties & engineering application of<br>Non- ferrous alloys – Duralumin, Monal metal & Woods metal.<br>Ferrous alloys – Heat resisting steel, magnetic steel, stainless steel. | <b>08</b>        | <b>14</b>                 |
| <b>CCG103-8</b> Use appropriate lubricant to solve industrial problems.          |  |                  |                           |
| <b>8</b>   | <b>LUBRICANTS</b><br>8.1 Definition, classification & functions of lubricants.<br>8.2 Lubrication & its types –<br>1. Fluid film lubrication<br>2. Boundary lubrication<br>3. Extreme pressure lubrication   | <b>04</b>        | <b>08</b>                 |

|   |  |           |           |
|---|--|-----------|-----------|
|   | 8.3 Characteristics of lubricants –<br>Viscosity, Viscosity index, Oiliness, Volatility, Cloud point & Pour point, Flash & Fire point, Acid value.   |           |           |
| <b>CCG103-9</b> Select paint and varnish for different applications in the field of engineering   |  |           |           |
| <b>9</b>  | <b>PAINT &amp; VARNISH</b><br>9.1 Oil paint – Definition & characteristics of oil paint.<br>9.2 Purpose of using oil paint.<br>9.3 Ingredients of oil paint with suitable example & its functions – Drying oil (Vehicle), Drier, Pigment, Thinner, Filler (Extenders), Plasticizer.<br>9.4 Varnish – Definition, types, constituents, properties & applications.<br>9.5 Distinction between paint & varnish. | <b>04</b> | <b>06</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Section / Topic no. | Name of topic                          | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total marks |
|---------------------|--|--|------------|-------------|----------------|-------------|
|                     |  | Remember                                     | Understand | Application |                |             |
| I / 1               | Atomic structure and chemical bonding. | 06   | 02         | -           | CCG103-1       | 08          |
| I / 2               | Electrochemistry.                      | 02   | 02         | 04          | CCG103-2       | 08          |
| I / 3               | Corrosion & protective coating.        | 02   | 02         | 02          | CCG103-3       | 06          |
| I / 4               | Catalysis.                             | 02   | 02         | -           | CCG103-4       | 04          |
| I / 5               | Chemistry of non-metallic engineering. | 04   | 06         | 04          | CCG103-5       | 14          |
| II/6                | Water.                                 | 04   | 04         | 04          | CCG103-6       | 12          |
| II/7                | Metallurgy & alloys.                   | 06   | 06         | 02          | CCG103-7       | 14          |
| II/8                | Lubricants.                            | 04   | 02         | 02          | CCG103-8       | 08          |
| II/9                | Paint & varnish.                       | 02   | 02         | 02          | CCG103-9       | 06          |
|                     | <b>Total</b>                           |  |            |             |                | <b>80</b>   |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**Criteria for Continuous Assessment of Practical work**

**c) Assessment Criteria for Lab work :**

**i) Continuous Assessment of Practical Assignments:**

Every practical assignment shall be assessed for 25 marks as per given criteria.

| Domain       | Particulars                | Marks out of 50 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 05              |
|              | Application                | 05              |
| Psychomotor  | Operating Skills           | 10              |
|              | Writing skills             | 10              |
| Affective    | Discipline and punctuality | 10              |
|              | Timeliness and accuracy    | 10              |
| <b>TOTAL</b> |                            | <b>50</b>       |

**ii) Progressive Skill Test:**

One mid-term Progressive Skill Test of 25 marks shall be conducted as per criteria given below

**Criteria for Continuous Assessment of Practical work and Progressive skill Test:**

| Domain       | Particulars                | Marks out of 50 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 05              |
|              | Application                | 05              |
| Psychomotor  | Operating Skills           | 05              |
|              | Writing skills             | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Timeliness and accuracy    | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

Final marks of term work shall be awarded as per *Assessment Pro-forma II*.

**d) Criteria for assessment at semester end practical exam :**

Every student has to perform one practical within 2 hours at semester end practical exam which shall be assessed as per following criteria.

| Sr. no | Criteria                             | Marks allotted |
|--------|--------------------------------------|----------------|
| 1      | Preparedness for practical           | 10             |
| 2      | Correct figures / diagrams           | 10             |
| 3      | Observation tables                   | 10             |
| 4      | Result table / calculations / graphs | 10             |
| 5      | Safety / use of proper tools         | 10             |
|        | <b>Total</b>                         | <b>50</b>      |



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**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Home Assignments
4. Discussion.

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Item Bank
5. Use of Charts.

**REFERENCE MATERIAL :a) Books / IS Codes**

| Sr. No. | Author                   | Title                                  | Publisher                  |
|---------|--------------------------|--|----------------------------|
| 1.      | Jain & Jain              | Engineering chemistry                  | Dhanpatrai publishing co.  |
| 2.      | S. C. Rangawala          | Engineering materials                  | Engineering publication    |
| 3.      | Jain & Agarwal           | Metallurgical Analysis                 | Agarwal publications       |
| 4.      | O. P. Khanna             | Material science & technology          | Khanna publication on 2006 |
| 5.      | Rollason                 | Metallurgy for Engineers               | ASM publication            |
| 6.      | J. C. Kuriacose          | Chemistry in Engineering & Vol. 1 & 11 | -                          |
| 7.      | P. C. Jain               | Chemistry of Engineering Materials     | -                          |
| 8       | S. S. Dara               | A text of Engineering Chemistry        |                            |
| 9.      | R.Gopalan,<br>D.Venkappa | Engineering Chemistry                  | Vikas publishing house     |

**b) Websites**

- viii) [www.substech.com](http://www.substech.com)
- ix) [www.kentchemistry.com](http://www.kentchemistry.com)
- x) [www.chemcollective.org](http://www.chemcollective.org)
- xi) [www.wqa.org](http://www.wqa.org)
- xii) [www.chemistryteaching.](http://www.chemistryteaching)

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**COURSE ID:**

**Course Name** : BASIC MATHEMATICS.(CE/ME/EE/MT/IE/ET/IT)  
**Course Code** : CCG105  
**Course Abbreviation** : GBMT

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : <nil >

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 04      |
| Tutorial         | 01           |         |

**Evaluation Scheme:**

| Component Details and Duration | Progressive Assessment                |                              | Term End                        |           | Total |
|--------------------------------|---------------------------------------|------------------------------|---------------------------------|-----------|-------|
|                                | Theory                                | Tutorials                    | Theory                          | Practical |       |
|                                | Average of two tests of 20 marks each | As mentioned in the syllabus | Term End Theory Exam (03 hours) | NIL       |       |
| Marks                          | 20                                    | --                           | 80                              | --        | 100   |

**RATIONALE:**

Mathematics is an important prerequisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of mathematics is an effective tool to pursue and master the applications in the engineering and technological fields. Algebra provides the language and abstract symbols of mathematics. The topics Matrices and Determinants are helpful for finding optimum solution of system of simultaneous equations which are formed in the various branches of engineering using different parameters. Trigonometry is the study of triangles and angles. Contents of this subject will form foundation for further study in mathematics.

**COMPETENCY:**

Apply principles of Basic Mathematics to solve mathematical problems as follows –

1. **Cognitive** : To understand the mathematical concepts
2. **Psychomotor**: Proper handling of scientific calculator
3. **Affective** : Attitude of accuracy, punctuality, proper reasoning and presentation

**Course Outcomes (CO's):**

- CCG105-1:** To solve given problems based on laws of logarithm.  
**CCG105-2:** To solve simultaneous equations using Cramer's rule & find area of triangle.  
**CCG105-3:** To resolves a given function into partial fractions.  
**CCG105-4:** To learn algebra of matrices & hence find Adjoint & Inverse of a given matrix.  
**CCF105-5:** To memorize and solve problems using trigonometric formulae.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design / development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering practices for society, sustainability & environment | PO 6<br>Project Management | PO 7<br>Life – long learning | PSO1<br>Plan & Design | PSO2<br>Construction & Maintenance |
|---|---|--------------------------|---|--|---|----------------------------|------------------------------|-----------------------|------------------------------------|
| <b>Competency:</b><br>Apply principles of Basic Mathematics to solve mathematical problems      | 3   | 2                        | 1   | 3  | -   | -                          | 3                            |                       |                                    |
| <b>CCG105-1:</b> To solve given problems based on laws of logarithm                             | 3   | 2                        | 1   | 2  | -   | -                          | 3                            |                       |                                    |
| <b>CCG105-2 :</b><br>To solve simultaneous equations using Cramer's rule.                       | 3   | 2                        | 1   | 2  | -   | -                          | 3                            |                       |                                    |
| <b>CCG105-3 :</b> To resolve a given function into partial fractions.                           | 3   | 2                        | 2   | 2  | -   | -                          | 3                            |                       |                                    |
| <b>CCG105-4 :</b> To learn algebra of matrices & hence find Adjoint & Inverse of a given matrix | 3   | 2                        | 2   | 2  | -   | -                          | 3                            |                       |                                    |
| <b>CCG105-5 :</b> To memorize and solve problems using trigonometric formulae.                  | 3   | 2                        | 2   | 3  | -   | 1                          | 3                            |                       |                                    |

**CONTENT:**

A) **TUTORIALS:** Note - Tutorials are to be used to get enough practice

| Sr.No | Topics                                  | Tutorial Content (10 problems in each tutorial)   |
|-------|---|---|
| 1     | Logarithm                               | Solve simple problems of Logarithms based on definition and laws  |
| 2     | Determinants                            | Solve problems on determinant to find area of triangle, and solution of simultaneous equations by Cramer's rule |
| 3     | Partial Fractions                       | To resolve given function into partial fraction using appropriate method.                                       |
| 4     | Matrices                                | Examples on addition, Subtraction and Multiplication of Matrix  |
| 5     | Matrices                                | To find Adjoint, Inverse of a given matrix.   |
| 6     | Trigonometric Ratios and Identities     | Examples on conversion of degree to radian and vice versa, simple examples on trigonometry.                     |
| 7     | Allied Angles                           | Solve examples on Allied angles   |
| 8     | Compound Angles                         | Solve examples on Compound angles   |
| 9     | Factorization & De-factorization angles | Solve examples on Factorization & De-factorization formulae   |
| 10    | Inverse Trigonometric Ratios            | Solve examples on principle value and Inverse trigonometric functions   |

B) **THEORY :**

**Section I**

| Sr. No. | Topics / Sub-topics | Lectures (Hours) | Theory Evaluation (Marks) |
|---------|---------------------|------------------|---------------------------|
|---------|---------------------|------------------|---------------------------|

|   |  |           |           |
|---|--|-----------|-----------|
| <b>Course Outcome CCG105-1: To solve given problems based on laws of logarithm.</b>   |  |           |           |
| <b>1</b>  | <b>Logarithm</b><br>1.1 Concept & laws of logarithm<br>1.2 Simple examples based on laws of logarithm  | <b>4</b>  | <b>6</b>  |
| <b>Course Outcome CCG105-2 : To solve simultaneous equations using Cramer's rule</b>  |  |           |           |
| <b>2</b>  | <b>Determinants</b><br>2.1 Definition of nth order determinant<br>2.2 Expansion of second and third order determinants<br>2.3 To solve simultaneous equations having 3 unknowns using Cramer's Rule<br>2.4 Consistency of equations using Determinants<br>2.5 Area of Triangle by determinant method | <b>04</b> | <b>06</b> |
| <b>Course Outcome CCG105-3 :To resolve a given function into partial fractions</b>  |  |           |           |
| <b>3</b>  | <b>Partial Fractions</b><br>3.1 Definition of rational, proper and improper fractions<br>3.2 Various cases of Partial fractions and Examples   | <b>06</b> | <b>12</b> |
| <b>Course Outcome CCG105-4 :To learn algebra of matrices &amp; hence find Adjoint &amp; Inverse of a given matrix</b>   |  |           |           |
| <b>4</b>  | <b>Matrices</b><br>4.1 Definition of a matrix, Types of matrices<br>4.2 Algebra of matrices<br>4.3 Equality of two matrices, Transpose of a matrix<br>4.4 Minor and Co-factor of an element of a matrix<br>4.5 Adjoint and Inverse of a matrix   | <b>10</b> | <b>16</b> |
|   | <b>Total</b>   | <b>24</b> | <b>40</b> |
| <p>1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> <p>2.In each topic, corresponding applications will be explained</p> |  |           |           |

### Section II

| <b>Sr. No.</b>   | <b>Topics / Sub-topics</b>  | <b>Lectures (Hours)</b> | <b>Theory Evaluation (Marks)</b> |
|--|---|-------------------------|----------------------------------|
| <b>Course Outcome CCG105-5: To memorize and solve problems using trigonometric formulae.</b> |   |                         |                                  |
| <b>5</b>   | <b>Trigonometric Ratios and Identities</b><br>5.1 Fundamental Identities(Simple examples)<br>5.2 Definition of radian measure<br>5.3 Conversion of degree into radian and vice versa of standard angles | <b>02</b>               | <b>04</b>                        |

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <i>Course Outcome CCG105-5: To memorize and solve problems using trigonometric formulae.</i>  |  |                  |                           |
| 6   | <b>Trigonometric ratios of Compound and Allied Angles</b><br>6.1 Proofs of sine, cosine and tan of (A+B) and (A-B)<br>6.2 Examples | 06               | 08                        |
| 7   | <b>Trigonometric ratios of Multiple Angles</b><br>7.1 Proofs of sine, cosine and tangent of $2\theta$ , $3\theta$<br>7.2 Examples  | 05               | 10                        |
| 8   | <b>Factorization and Defactorization Formulae</b><br>8.1 Proofs of above formulae<br>8.2 Examples                                  | 04               | 08                        |
| 9   | <b>Inverse Trigonometric Ratios</b><br>9.1 Definition<br>9.2 Principle value<br>9.3 Proof of standard formulae<br>9.4 Examples     | 07               | 10                        |
|   | <b>Total</b>   | <b>24</b>        | <b>40</b>                 |
| <p>1. Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> <p>2. In each topic corresponding application will be explained</p> |  |                  |                           |

**Specification table for setting question paper for semester end theory examination :**

| Topic No.    | Name of topic                           | Distribution of marks (level wise) |               |             | Total Marks |
|--------------|---|------------------------------------|---------------|-------------|-------------|
|              |   | Knowledge                          | Comprehension | Application |             |
| 1            | Logarithm                               | 2                                  | -             | 4           | 06          |
| 2            | Determinants                            | -                                  | 2             | 4           | 06          |
| 3            | Partial Fractions                       | 2                                  | 2             | 8           | 12          |
| 4            | Matrices                                | 2                                  | 2             | 12          | 16          |
| 5            | Trigonometric Ratios and Identities     | 2                                  | -             | 2           | 04          |
| 6            | Allied Angles                           | 2                                  | 2             | 4           | 08          |
| 7            | Compound Angles                         | 2                                  | -             | 8           | 10          |
| 8            | Factorization & De-factorization angles | 2                                  | -             | 6           | 08          |
| 9            | Inverse Trigonometric ratios            | 2                                  | 2             | 6           | 10          |
| <b>TOTAL</b> |   | <b>16</b>                          | <b>10</b>     | <b>54</b>   | <b>80</b>   |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

### **INSTRUCTIONAL STRATEGIES :**

#### **Instructional Methods:**

1. Lectures cum Demonstrations
2. Tutorials

#### **Teaching and Learning resources:**

1. Chalk board
2. Item Bank
3. MSBTE videos

### **REFERENCE MATERIAL :**

#### **a) Books:**

| <b>Sr. No.</b> | <b>Author</b>           | <b>Title</b>  | <b>Publisher</b>                |
|----------------|-------------------------|---|---------------------------------|
| 1.             | G.V. Kumbhojkar         | A Text Book on Engineering Mathematics (First Year Diploma) | Phadake Prakashan, Kolhapur     |
| 2.             | B.S. Grewal             | Higher Engginiring Mathematics                              | Khanna Publication, New Dhelhi  |
| 3.             | H.K.Das                 | Higher Engginiring Mathematics                              | S.Chand Publication, New Dhelhi |
| 4.             | Patel, Rawal and others | Basic Mathematics   | Nirali Prakashan, Pune          |
| 5.             | P.M.Patil and Others    | Basic Mathematics   | Vision Prakashan, Pune          |
| 6.             | S. S. Shastry           | Engineering Mathematics                                     | Prentice Hall of India          |
| 7.             | Sameer Shaha            | Basic Mathematics   | Tech Max Publication            |

#### **b) Website**

- i) [www.khanacademy.org](http://www.khanacademy.org)
- ii) [www.easycalculation.com](http://www.easycalculation.com)
- iii) [www.math-magic.com](http://www.math-magic.com)

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|                            |   |
|----------------------------|---|
| <b>COURSE ID</b>           | <b>: CE</b>                                 |
| <b>Course Name</b>         | <b>: ENGINEERING MATHEMATICS.(CE/ME/MT)</b> |
| <b>Course Code</b>         | <b>: CCG106</b>                             |
| <b>Course Abbreviation</b> | <b>: GEMA</b>                               |

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CCG105 Basic Mathematics**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 04      |
| Tutorial         | 01           |         |

**Evaluation Scheme :**

| Component Details and Duration        | Progressive Assessment       |                                 | Term End |           | Total |
|---------------------------------------|------------------------------|---------------------------------|----------|-----------|-------|
|                                       | Theory                       | Assignments                     | Theory   | Practical |       |
| Average of two tests of 20 marks each | As mentioned in the syllabus | Term End Theory Exam (03 hours) | ---      |           |       |
| Marks                                 | 20                           | --                              | 80       | --        | 100   |

**RATIONALE:**

This subject is an extension of Basic mathematics of first semester and a bridge to further study of applied mathematics. The knowledge of mathematics is useful in other technical areas. Differential calculus has applications in different engineering branches. For example concepts such as bending moment, curvature, maxima and minima. Numerical methods are used in programming as an essential part of computer engineering. In Metrology and quality control statistical methods are used to determine the quality and suitability of components. Engineering mathematics lays the foundation to understand technical principles in various fields.

**Competency:**

Apply principles of Engineering Mathematics to solve Engineering problems as follows-

- 1. Cognitive** : Understanding and applying principles of Engineering Mathematics to Engineering problems
- 2. Psychomotor** : a) Use of co-ordinate geometry in animation, autocad, computer graphics etc.  
b) Proper handling of calculator.
- 3. Affective** : Attitude of accuracy, punctuality, presentation, visualization.

**Course Outcomes (CO's) :**



- CCG106 - 1** : To understand and solve examples of complex numbers.  
**CCG106 - 2** : To solve problems on two dimensional co-ordinate geometry for straight line.  
**CCG106 - 3** : To solve problems on Probability using addition theorem.  
**CCG106 – 4** : Utilize basic concepts of probability distribution to solve elementary engineering Problems.  
**CCG106-5** :To find limits of different types of functions using various methods.  
**CCG106-6** : To solve the problems of maxima, minima and geometrical applications.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels** : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs   | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design / development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering practices for society, sustainability & environment | PO 6<br>Project Management | PO 7<br>Life –long learning | PSO1<br>Plan & Design | PSO2<br>Construction & Maintenance |
|--|---|--------------------------|---|--|---|----------------------------|-----------------------------|-----------------------|------------------------------------|
| <b>Competency:</b> Apply principles of Engineering Mathematics to solve Engineering problems                   | 3   | 2                        | 2   | 2  | 1   | -                          | 3                           |                       |                                    |
| <b>CCG106-1</b> : To understand and solve examples of complex numbers.   | 3   | 2                        | 2   | 2  | 1   | -                          | 3                           |                       |                                    |
| <b>CCG106-2</b> : To solve problems on two dimensional co-ordinate geometry for straight line                  | 3   | 2                        | 2   | 2  | 1   | -                          | 3                           |                       |                                    |
| <b>CCG106-3</b> : To solve problems on Probability using addition theorem.                                     | 3   | 2                        | 2   | 2  | 3   | -                          | 3                           |                       |                                    |
| <b>CCG106-4</b> : Utilize basic concepts of probability distribution to solve elementary engineering Problems. | 3   | 2                        | 2   | 2  | 3   | -                          | 3                           |                       |                                    |
| <b>CCG106-5</b> :To find limits of different types of functions using various methods.                         | 3   | 2                        | 2   | 2  | 1   | -                          | 3                           |                       |                                    |
| <b>CCG106-6</b> : To solve the problems of maxima, minima and geometrical applications.                        | 3   | 2                        | 2   | 2  | 3   | -                          | 3                           |                       |                                    |

**CONTENT:**

B. **TUTORIALS** : Note - Tutorials are to be used to get enough practice

| Sr No. | Topic                                  | Tutorial Content (10 problems in each tutorial)   |
|--------|--|---|
| 1      | Complex Number                         | Solve problems based on algebra of complex numbers & De-moivre's theorem  |
| 2      | Straight line                          | Examples on different cases of straight line, to find perpendicular distance of a point from a line, angle between two lines, intersection of lines |
| 3      | Probability & Probability Distribution | Examples on Addition theorem & Solve problems based on Binomial distribution  |
| 4      | Probability Distribution               | Solve problems based on Poisson distribution  |
| 5      |  | Solve problems based on Normal distribution   |
| 6      | Functions                              | Examples on value of functions, Odd & Even functions , Composite functions  |
| 7      | Limits                                 | Evaluation of limits by Factorization, Rationalization, Simplification, Infinity method   |
| 8      | Differentiation                        | To find derivatives by product rule, quotient rule, Chain rule, Inverse function, Implicit function   |
| 9      | Differentiation                        | To find derivatives of Parametric function, Logarithmic function, Derivatives of second order   |
| 10     | Applications of Derivatives.           | To find equation of Tangent, Normal & To find Maxima and Minima of a function.  |

B) **THEORY :**

**Section I**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|----------|--|------------------|---------------------------|
|          | <i>Course outcome CCG106-1 : To understand and solve examples of complex numbers.</i>  |                  |                           |
| <b>1</b> | <b>Complex Number</b><br>1.1 Definition, Algebra of complex numbers, simple examples<br>1.2 Polar form, Exponential form<br>1.3 De- Moivre's theorem   | <b>04</b>        | <b>10</b>                 |
|          | <i>Course outcome CCG106-2 : To solve problems on two dimensional co-ordinate geometry for straight line.</i>  |                  |                           |
| <b>2</b> | <b>The Straight line</b><br>2.1 Slope, intercepts & various methods of finding slope<br>2.2 Conditions for two straight lines to be parallel and Perpendicular to each others<br>2.3 Various forms of equations of straight line<br>2.4 Perpendicular distance of a point from a line<br>2.5 Distance between two parallel lines<br>2.6 Angle between two straight lines<br>2.7 Intersection of two straight lines | <b>06</b>        | <b>10</b>                 |
|          | <i>Course outcome CCG106-3 : To solve problems on Probability using addition theorem.</i>  |                  |                           |
| <b>3</b> | <b>Probability</b><br>3.1 Mathematical definition of Probability of any event<br>3.2 Addition theorem of Probability<br>3.3 Examples   | <b>04</b>        | <b>06</b>                 |
|          | <i>Course outcome CCG106-4 : Utilize basic concepts of probability distribution to solve elementary engineering Problems.</i>  |                  |                           |
| <b>4</b> | <b>Probability Distribution</b><br>4.1 Binomial distribution.<br>4.2 Poisson's distribution.<br>4.3 Normal distribution.   | <b>10</b>        | <b>14</b>                 |
|          | <b>Total</b>   | <b>24</b>        | <b>40</b>                 |

**Section II**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <i>Course outcome CCG106-5 :To find limits of different types of functions using various methods.</i>   |   |                  |                           |
| <b>5</b>  | <b>Functions</b><br>5.1 Definition and Concept of function<br>5.2 Definition of Odd & Even functions, Explicit & implicit functions, Composite functions, Parametric functions<br>5.3 Value of a function<br>5.4 Examples on value of functions, Odd & Even functions , Composite functions   | <b>04</b>        | <b>06</b>                 |
| <b>6</b>  | <b>Limits</b><br>6.1 Definition<br>6.2 Limits of algebraic functions by factorization, simplification, rationalization ,Limit as $x \rightarrow \infty$   | <b>05</b>        | <b>08</b>                 |
| <i>Course outcome CCG106-6: To solve the problems of maxima, minima and geometrical applications.</i>   |   |                  |                           |
| <b>7</b>  | <b>Differentiation</b><br>7.1 Definition, Derivative of standard functions (without poof),<br>7.2 Derivative of sum, difference, product and quotient of two or more functions<br>7.3 Derivative of composite functions<br>7.4 Derivative of Inverse functions<br>7.5 Derivative of Implicit functions<br>7.6 Derivative of Parametric functions<br>7.7 Derivative of exponential and logarithmic functions<br>7.8 Logarithmic differentiation<br>7.9 Differentiation of second order | <b>12</b>        | <b>20</b>                 |
| <b>8</b>  | <b>Applications Of Derivatives</b><br>8.1 Geometrical meaning of derivative (To find equation of Tangent and normal )<br>8.2 Maxima and minima of functions   | <b>03</b>        | <b>06</b>                 |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>                 |
| <p>1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> <p>2. In each topic corresponding applications will be explained</p> |   |                  |                           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic               | Distribution of marks (level wise) |               |             | Total Marks |
|-----------|-----------------------------|------------------------------------|---------------|-------------|-------------|
|           |                             | Knowledge                          | Comprehension | Application |             |
| 1         | Complex Number              | 4                                  | 2             | 4           | 10          |
| 2         | Straight line               | 2                                  | 2             | 6           | 10          |
| 3         | Probability                 | 2                                  | -             | 4           | 6           |
| 4         | Probability Distribution    | 4                                  | 2             | 8           | 14          |
| 5         | Functions                   | 2                                  | -             | 4           | 6           |
| 6         | Limits                      | 2                                  | 2             | 4           | 8           |
| 7         | Differentiation             | 4                                  | 4             | 12          | 20          |
| 8         |                             |                                    |               |             |             |
| 9         | Applications Of Derivatives | --                                 | --            | 6           | 6           |
| Total     |                             | 20                                 | 12            | 48          | 80          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Tutorials

**Teaching and Learning resources:**

1. Chalk board
2. Item Bank
3. MSBTE videos

**REFERENCE MATERIAL:**

**a) Books:**

| Sr. No. | Author                  | Title                          | Publisher                       |
|---------|-------------------------|--------------------------------|---------------------------------|
| 1.      | G.V. Kumbhojkar         | Engineering Mathematics III    | Phadake Prakashan, Kolhapur     |
| 2.      | B.S. Grewal             | Higher Engineering Mathematics | Khanna Publication, New Dhelhi  |
| 3.      | H.K. Das                | Higher Engineering Mathematics | S.Chand Publication, New Dhelhi |
| 4.      | Patel, Rawal and others | Engineering Mathematics        | Nirali Prakashan, Pune          |

|    |                             |                         |                                |
|----|-----------------------------|-------------------------|--------------------------------|
| 5. | Mathematics for Polytechnic | S. P. Deshpande         | Pune Vidyarthi Griha Prakashan |
| 6. | Sameer Shaha                | Engineering Mathematics | Tech-Max Publication, Pune     |
| 7. | A.M. Vaidya                 | Applied Mathematics     | Central Techno                 |
| 8. | P.M.Patil and Others        | Engineering Mathematics | Vision Prakashan, Pune         |

**b) Websites:**

- i) [www.khanacademy.org](http://www.khanacademy.org)
- ii) [www.easycalculation.com](http://www.easycalculation.com)
- iii) [www.math-magic.com](http://www.math-magic.com)

\* \* \*

**COURSE ID** : CE  
**Course Name** : ENGINEERING DRAWING -1 (CE/ME/MT)  
**Course Code** : CCG107  
**Course Abbreviation** : GEDA

### 1. TEACHING AND EVALUATION SCHEME:

**Pre-requisite Course(s):** Nil

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                                  | Total |
|-----------------------|---------------------------------------|---|---------------------------------|----------------------------------|-------|
|                       | Theory                                | Practical   | Theory Examination              | Practical Examination (Internal) |       |
| Details of Evaluation | Average of two tests of 20 marks each | i. 25 marks for each practical<br>ii. One PST of 25 marks | Term End Theory Exam (03 hours) | Term end practical exam          |       |
| Marks                 | 20                                    | As per Proforma-II  | 80                              | 25 I                             | 125   |

I- Internal Assessment

### 2. RATIONALE:

Engineering drawing is the language of engineers. The concept of engineering drawing is used to develop, express the ideas, and convey the instructions which are used to carry out jobs in the field of Engineering. The course illustrates the techniques of drawing in actual practice. This Preliminary course aims at building a foundation for the further course in drawing and other allied subjects. This subject is useful in developing, drafting and sketching skills of students.

### 3. COMPETENCY:

Use various drawing Instruments for drafting and sketching solid geometry

a) **Cognitive:** Understand various drawing procedures.

b) **Psychomotor:** Draw engineering curves & projections of lines, planes & solids

c) **Affective:** Attitude of using i) Procedures ii) Practices iii) Drawing Instruments

iv) Accuracy v) Drafting Skill

### 4. COURSE OUTCOMES:

**CCG107-1** Understand various fundamentals in engineering drawing.

**CCG107-2** Produce different types of engineering curves.

**CCG107-3** Produce the projection of point & lines inclined to one reference plane..

**CCG107-4** Produce the projection of different planes.

**CCG107-5** Produce orthographic drawing and sectional orthographic drawing from given Pictorial view

## 5. COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”: no correlation]

| Competency and COs | Programme outcome POs and PSO's                 |                          |  |  |   |                            |                            |                                     |   |
|--------------------|---|--------------------------|--|--|---|----------------------------|----------------------------|-------------------------------------|---|
|                    | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem Analysis | PO3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & testing | PO 5<br>Engineering Practices for society, sustainability and Environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO1<br>Work in mfg& service sector | PSO 2<br>Start entrepreneurial activity |
| CCG107-1           | 3   | -                        | -                                      | -  | -   | -                          | -                          | -                                   | -                                       |
| CCG107-2           | 3   | -                        | 1                                      | -  | -   | -                          | -                          | -                                   | -                                       |
| CCG107-3           | 3   | -                        | -                                      | 1  | 1   | -                          | -                          | -                                   | -                                       |
| CCG107-4           | 3   | -                        | 1                                      | -  | -   | -                          | -                          | -                                   | -                                       |
| CCG107-5           | 3   | -                        | 1                                      | 1  | -   | -                          | -                          | -                                   | -                                       |

## 6. CONTENT

### A. LAB AND PRACTICAL WORK:

Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as Term Work as detailed in practical sessions of batches of about 22 students

| Sr. no | Laboratory experience                       | Skills developed  | Course Outcome |
|--------|---|---|----------------|
| 1      | Lines and Lettering (1 Sheet)               | To develop drawing skill                                      | CCG107-1       |
| 2      | Engineering curves (1 Sheet)                | To develop drawing ability in conics                          | CCG107-2       |
| 3      | Projections of line (1 Sheet)               | To develop drawing ability in Projections of line             | CCG107-3       |
| 4      | Projections of Planes (1 Sheet)             | To develop drawing ability in Projections of Planes           | CCG107-4       |
| 5      | Orthographic projection (1 Sheet)           | To develop drawing ability to draw different views of object. | CCG107-5       |
| 6      | Sectional Orthographic projection (1 Sheet) | To develop drawing ability to draw Sectional views of object. | CCG107-5       |

### B) THEORY

#### SECTION – I

| Sr. No  | Topics | Teaching (Hours) | Theory Evaluation Marks |
|---|--------|------------------|-------------------------|
| <i>Course Outcome CCG107-1 Understand various fundamentals in engineering drawing</i> |        |                  |                         |



|  |   |           |           |
|--|---|-----------|-----------|
| <b>1.</b>  | <b>Introduction To Engineering Drawing</b><br>1.1 Drawing Instruments and their uses<br>1.2 Standard sizes of drawing sheets (ISO-A series)<br>1.3 Letters and numbers (single stroke vertical)<br>Convention of lines and their applications.<br>1.4 Scale (reduced, enlarged & full size) Plain scale and Diagonal scale.<br>1.5 Dimensioning technique as per SP-46 (Latest Edition)<br>Types and applications of chain, parallel and Co-ordinate dimensioning | <b>06</b> | <b>08</b> |
| <i>Course Outcome CCG107-2 Produce different types of engineering curves</i>                               |   |           |           |
| <b>2.</b>  | <b>Engineering Curves</b><br>2.1 Conic curves and their applications<br>2.2 Ellipse by Arc's of circle method & Concentric circles method.<br>2.3 Parabola by Directrix and focus method & Rectangle method<br>2.4 Hyperbola by Transverse Axis focus Method & Rectangular hyperbola (Inclined axes).<br>2.5 Involute of circle, & pentagon, hexagon<br>2.6 cycloid, epicycloids, hypocycloid<br>2.7 Helix & Archimedean spiral.                                  | <b>12</b> | <b>20</b> |
| <i>Course Outcome CCG107-3 Produce the projection of point &amp; lines inclined to one reference plane</i> |   |           |           |
| <b>3.</b>  | <b>Projection Of Point and Lines</b><br>3.1 Projection of points when point is in first quadrant Only<br>3.2 Projection of Line inclined to one Reference plane and Parallel to other Reference Plane (Both ends of line should be in first quadrant)   | <b>06</b> | <b>12</b> |

**SECTION – II**

| <b>Sr. No</b>   | <b>Topics</b>   | <b>Teaching (Hours)</b> | <b>Theory evaluation Marks</b> |
|---|---|-------------------------|--------------------------------|
| <i>Course Outcome CCG107-4 Produce the projection of different planes.</i>  |   |                         |                                |
| <b>4.</b>   | <b>Projection Of Planes</b><br>4.1 Projection of Planes - Circular, Square, Triangular, Rectangular, Pentagonal, Hexagonal Shapes Inclined to One Reference Plane And perpendicular to another Reference Plane. (Planes in First Quadrant Only) | <b>06</b>               | <b>12</b>                      |
| <i>Course Outcome CCG107-5 Produce orthographic drawing and sectional orthographic drawing from given pictorial view.</i> |   |                         |                                |

|   |   |           |            |
|---|---|-----------|------------|
| <b>5.</b>   | <b>Orthographic Projection</b><br>5.1 Introduction of Orthographic Projection-First and Third angle Projection Method<br>5.2 Conversion of Pictorial view into Orthographic Views.<br>(First angle Projection Method Only)<br>5.3 Dimensioning Technique as per SP-46 | <b>08</b> | <b>14</b>  |
| <i>Course Outcome CCG107-5 Produce orthographic drawing and sectional orthographic drawing from given pictorial view</i>  |   |           |            |
| <b>6.</b>   | <b>Sectional Views.</b><br>6.1 Types of sections<br>6.2 Conversion of pictorial view into sectional Orthographic views.(First Angle Projection Method only)   | <b>08</b> | <b>14</b>  |
| <i>Course Outcome CCG107-1 Understand various fundamentals in engineering drawing</i>   |   |           |            |
| <b>7.</b>   | <b>AUTOCAD</b><br>7.1 Introduction to CAD software (Basic commands like Draw, modify). Advantages of CAD,<br>7.2 Geometrical Constructions<br>7.3 Draw a basic 2-D geometrical entities using CAD   | <b>02</b> | <b>NIL</b> |
| <b>Total</b>  |   | <b>48</b> | <b>80</b>  |
| 1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |            |
| 2.No theory question on chapter no.7  |   |           |            |

**7. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION:**

| Topic No.    | Name of topic                       | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|--------------|-------------------------------------|--|------------|-------------|----------------|-------------|
|              |                                     | Remember                                     | Understand | Application |                |             |
| 1            | Introduction To Engineering Drawing | 04   | 02         | 02          | CCG107-1       | 08          |
| 2            | Engineering curves                  | 04   | 04         | 12          | CCG107-2       | 20          |
| 3            | Projection of Point And Lines       | 04   | 04         | 04          | CCG107-3       | 12          |
| 4            | Projection of Planes                | 04   | 06         | 02          | CCG107-4       | 12          |
| 5            | Orthographic Projection             | 04   | 08         | 02          | CCG107-5       | 14          |
| 6            | Sectional Views.                    | 04   | 08         | 02          | CCG107-5       | 14          |
| <b>Total</b> |                                     | 24   | 32         | 24          |                | 80          |

## 8. ASSESSMENT CRITERIA FOR CONTINUOUS ASSESSMENT AND PRACTICAL WORK

### a) Assessment Criteria for Lab work:

#### i) Continuous Assessment of Practical Assignments:

Every practical assignment shall be assessed for 25 marks as per given criteria.

| Sr No. | Criteria                      | Marks allotted |
|--------|-------------------------------|----------------|
| 1      | Attendance                    | 05             |
| 2      | Preparedness                  | 05             |
| 3      | Correctness and understanding | 10             |
| 4      | Line work and neatness        | 05             |
|        | <b>Total</b>                  | <b>25</b>      |

#### ii) Progressive Skill Test:

One mid-term *Progressive Skill Test* of 25marks shall be conducted as per criteria given below:

| Sr No | Criteria                                      | Marks allotted |
|-------|---|----------------|
| 1     | Correctness and understanding                 | 10             |
| 2     | Line work and neatness                        | 05             |
| 3     | Dimensioning and judgment without measurement | 05             |
| 4     | Proper use of instrument                      | 05             |
|       | <b>Total</b>                                  | <b>25</b>      |

#### b) Criteria for assessment at TermEnd Practical exam:

Every student has to perform term end practical exam which shall be assessed as per following criteria.

| Sr. no | Criteria                                      | Marks allotted |
|--------|---|----------------|
| 1      | Preparedness for practical                    | 05             |
| 2      | Correct drawing                               | 05             |
| 3      | Proper use of instrument                      | 05             |
| 4      | Line work and neatness                        | 05             |
| 5      | Dimensioning and judgment without measurement | 05             |
|        | <b>Total</b>                                  | <b>25</b>      |

## 9. INSTRUCTIONAL STRATEGIES:

### Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices

### Teaching and Learning resources:

1. Chalk board
2. LCD presentations
3. Audio presentations

- 
4. Computer, printer etc.
  5. Question Bank

**10. REFERENCE MATERIAL:**a) Reference Books:

| Sr. No. | Author             | Title                                      | Publisher                         |
|---------|--------------------|--|-----------------------------------|
| 1.      | N. D. Bhatt        | Engineering Drawing                        | Charotar Publishing House 2010    |
| 2.      | Amar Pathak        | Engineering Drawing                        | Dreamtech Press, 2010             |
| 3.      | D.Jolhe            | Engineering Drawing                        | Tata McGraw Hill Edu., 2010       |
| 4.      | M.B.Shah, B.C.Rana | Engineering Drawing                        | Pearson, 2010                     |
| 5.      | K. Venugopal       | Engineering Drawing and Graphics + AutoCAD | New Age Publication, Reprint 2006 |
| 6.      | IS Code, SP – 46   | Engineering Drawing Practice               | --                                |

b) Web References:

- i) <http://www.design-technology.info/IndProd/drawings/>
- ii) <http://graphicalcommunication.skola.edu.mt/syllabus/engineering-drawing/>
- iii) [http://en.wikipedia.org/wiki/Engineering\\_drawing](http://en.wikipedia.org/wiki/Engineering_drawing)
- iv) <http://www.engineeringdrawing.org/>
- v) [http://www.teachengineering.org/view\\_activity](http://www.teachengineering.org/view_activity)
- vi) [www.howtoread.co.in/2013/06/how-to-read-ed.html](http://www.howtoread.co.in/2013/06/how-to-read-ed.html)
- vii) <http://www.slideshare.net/akhilrocker143/edp>
- viii) <http://www.24framesdigital.com/pstulpule>

\* \* \*

**COURSE ID** : CE  
**Course Name** : ENGINEERING DRAWING - II (CE/ME/MT)  
**Course Code** : CCG108  
**Course Abbreviation** : GEDB

**1. TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s):** CCG107

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                                  | Total |
|-----------------------|---------------------------------------|---|---------------------------------|----------------------------------|-------|
|                       | Theory                                | Practical   | Theory Examination              | Practical Examination (Internal) |       |
| Details of Evaluation | Average of two tests of 20 marks each | i. 25 marks for each practical<br>ii. One PST of 25 marks | Term End Theory Exam (03 hours) | Term end practical exam          |       |
| Marks                 | 20                                    | --  | 80                              | 25 I                             | 125   |

**I- Internal Examination**

**2. RATIONALE:**

Engineering drawing is the graphical language of engineers. It describes the scientific facts, Concepts, principles and techniques of drawing in any engineering field to express the ideas, conveying the instructions, which are used to carry out jobs in engineering field. This course aim for building a foundation for the further course in drawing and other allied subjects

**3. COMPETENCY:**

Read, draw & interpret the engineering drawing of simple objects.

- a) **Cognitive** : Understand & visualize the given component drawing.
- b) **Psychomotor**: Produce engineering drawing from the given problem
- c) **Affective** : Attitude of using i) Procedures ii) Practices iii) Drawing instruments
- iv) Techniques v) Drafting skill

**4. COURSE OUTCOMES:**

- CCG108-1 Produce the projection of different solids.
- CCG108-2 Produce sectional views of different types of solids.
- CCG108-3 Draw proportionate free hand sketches.
- CCG108-4 Interpret the views & complete the missing view.
- CCG108-5 Visualize & draw accordingly the pictorial view by correlating the given views.
- CCG108-6 Construct development of lateral surfaces.

**5. COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO)**

**MATRIX:**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos | Programme outcome POs and PSO's                 |                          |  |  |   |                            |                            |                                     |   |
|--------------------|---|--------------------------|--|--|---|----------------------------|----------------------------|-------------------------------------|---|
|                    | Po 1<br>Basic and discipline specific knowledge | Po 2<br>problem analysis | Po3<br>Design/development of solutions | Po 4<br>engineering tools, experimentation & testing | Po 5<br>Engineering practices for society, sustainability and environment | Po 6<br>project management | Po 7<br>Life-long learning | Pso1<br>Work in mfg& service sector | Pso 2<br>Start entrepreneurial activity |
| Competency         |   |                          |  |  | -   |                            |                            |                                     |   |
| CCG108-1           | 3   |                          |  |  |   |                            | 1                          |                                     |   |
| CCG108-2           | 3   |                          |  |  |   |                            | 1                          |                                     |   |
| CCG108-3           | 3   |                          | 1                                      | 1  | 1   |                            | 1                          | 2                                   |   |
| CCG108-4           | 3   |                          |  |  |   |                            | 1                          |                                     |   |
| CCG108-5           | 3   |                          | 1                                      |  |   |                            | 1                          | 2                                   |   |
| CCG108-6           | 3   |                          | 1                                      |  | 1   |                            | 1                          | 2                                   | 1                                       |

**6. LAB OR PRACTICAL WORK**

**A) Practical Exercises and related skills to be developed:**

The following practical exercises shall be conducted as Term Work as detailed in practical sessions of batches of about 22 students:

| Sr. no | Laboratory experience             | Skills developed   | Course Outcome |
|--------|-----------------------------------|--|----------------|
| 1      | Projection Of Solids (1 Sheet)    | To develop drawing ability in projection of solids.  | CCG108-1       |
| 2      | Sections of Solids (1 Sheet)      | To develop drawing ability in section of solids.   | CCG108-1       |
| 3      | Free Hand Sketches (1 Sheet)      | To develop ability to draw free hand sketches of machine components, screw thread profile, riveted and welded joints | CCG108-3       |
| 4      | Missing Views (1 Sheet)           | To develop ability to draw Missing views and convert given view into sectional view.                                 | CCG108-4       |
| 5      | Isometric Projection (1 Sheet)    | To develop ability to draw Isometric projection  | CCG108-5       |
| 6      | Development of Surfaces (1 Sheet) | To develop drawing ability in Development of surfaces of cone, prism, pyramid and cylinder                           | CCG108-6       |

**B. CONTENT:**

**THEORY:**

**SECTION - I**

| Sr. No  | Topics   | Teaching (Hours) | Theory Evaluation Marks |
|---|--|------------------|-------------------------|
| <i>Course Outcome CCG108-1 Produce the projection of different solids.</i>          |  |                  |                         |
| <b>1.</b>   | <b>Projection Of Solids</b><br>1.1 Projection of Solids Like Cube, Prisms, Pyramids, Cone, Cylinders and Tetrahedron.<br>(Axis of Solids inclined to one reference plane and Parallel to another Reference Plane)  | <b>10</b>        | <b>16</b>               |
| <i>Course Outcome CCG108-2 Produce sectional views of different types of solids</i> |  |                  |                         |
| <b>2.</b>   | <b>Sections of Solids</b><br>2.1 Sections of Solids Like Cube, Prisms, Pyramids, Cone and Cylinders.(Axis of Solids being vertical and Section plane inclined to one reference plane and perpendicular to other Reference Plane                                  | <b>10</b>        | <b>16</b>               |
| <i>Course Outcome CCG108-3 Draw proportionate free hand sketches.</i>               |  |                  |                         |
| <b>3.</b>   | <b>Free Hand Sketches</b><br>3.1 Profiles of Screw Threads (V and Square Thread)<br>Conventional representation of threads.<br>3.2 Free hand sketches of nuts and bolts, Washer, Locking arrangement of nuts, Foundation bolts<br>3.3 Riveted and Welded Joints. | <b>04</b>        | <b>08</b>               |

**SECTION – II**

| Sr. No   | Topics   | Teaching (Hours) | Theory Evaluation Marks |
|--|--|------------------|-------------------------|
| <i>Course Outcome CCG108-4 Interpret the views &amp; complete the missing view.</i>                                |  |                  |                         |
| <b>4.</b>  | <b>Missing Views.</b><br>4.1 Interpretation of the given two orthographic views and draw missing view from the given two Orthographic views and convert one of the given views into sectional Orthographic views. (First Angle Projection Method only) | <b>06</b>        | <b>08</b>               |
| <i>Course Outcome CCG108-5 Visualize &amp; draw accordingly the pictorial view by correlating the given views.</i> |  |                  |                         |
| <b>5.</b>  | <b>Isometric Projection</b><br>5.1 Introduction<br>5.2 Isometric Axis<br>5.3 Isometric scale<br>5.4 Isometric view and Isometric Projection  | <b>10</b>        | <b>16</b>               |

|   |   |           |           |
|---|---|-----------|-----------|
|   | 5.5 Conversion of Orthographic Views into Isometric View/Projection<br>(Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces) |           |           |
| <b>Course Outcome CCG108-6</b> Construct development of lateral surfaces.   |   |           |           |
| <b>6.</b>   | <b>Developments of Surfaces</b><br>6.1 Methods of Development<br>6.2 Developments of Lateral surfaces of right solids Prism, Cylinders, Pyramid and Cone.                         | <b>08</b> | <b>16</b> |
|   | <b>Total</b>  | <b>48</b> | <b>80</b> |
| 1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

**7. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION:**

| Topic No. | Name of topic            | Distribution of marks (Cognitive level wise) |            |             | Course Outcome | Total Marks |
|-----------|--------------------------|--|------------|-------------|----------------|-------------|
|           |                          | Remember                                     | Understand | Application |                |             |
| 1         | Projection Of Solids     | 06   | 06         | 04          | CCG108-1       | 16          |
| 2         | Sections of Solids       | 06   | 06         | 04          | CCG108-2       | 16          |
| 3         | Free Hand Sketches       | 04   | 02         | 02          | CCG108-3       | 08          |
| 4         | Missing Views            | 02   | 04         | 02          | CCG108-4       | 08          |
| 5         | Isometric Projection     | 04   | 04         | 08          | CCG108-5       | 16          |
| 6         | Developments of Surfaces | 04   | 08         | 04          | CCG108-6       | 16          |
|           | <b>Total</b>             | 26   | 30         | 24          |                | 80          |

**8. CRITERIA FOR CONTINUOUS ASSESSMENT OF PRACTICAL WORK AND PROGRESSIVE SKILL TEST:**

**a) Assessment Criteria for Lab work:**

**i) Continuous Assessment of Drawing Practical**

Every practical Sheet shall be assessed for **25** marks as per criteria given below:

| Sr No. | Criteria                      | Marks allotted |
|--------|-------------------------------|----------------|
| 1      | Attendance                    | 05             |
| 2      | Preparedness                  | 05             |
| 3      | Correctness and understanding | 10             |
| 4      | Line work and neatness        | 05             |
|        | Total                         | 25             |

**ii) Progressive Skill Test:**



One mid-term *Progressive Skill Test* of 25marks shall be conducted as per criteria given below:

| Sr No. | Criteria                                      | Marks allotted |
|--------|---|----------------|
| 1      | Correctness and understanding                 | 10             |
| 2      | Line work and neatness                        | 05             |
| 3      | Dimensioning and judgment without measurement | 05             |
| 4      | Proper use of instrument                      | 05             |
|        | Total   | 25             |

**b) Criteria for assessment at Term End Practical Exam:**

Every student has to perform term end practical exam which shall be assessed as per following criteria.

| Sr. no | Criteria                                      | Marks allotted |
|--------|---|----------------|
| 1      | Preparedness for practical                    | 05             |
| 2      | Correct drawing                               | 05             |
| 3      | Proper use of instrument                      | 05             |
| 4      | Line work and neatness                        | 05             |
| 5      | Dimensioning and judgment without measurement | 05             |
|        | Total   | 25             |

**9. INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

- i) Lectures cum Demonstrations
- ii) Classroom practices

**Teaching and Learning resources:**

- i) Chalk board
- ii) LCD presentations
- iii) Audio presentations
- iv) Computer, printer etc.
- v) Question Bank

**10. REFERENCE MATERIAL:**

**a) Reference Books:**

| Sr. No. | Author                | Title                                      | Publisher                         |
|---------|-----------------------|--|-----------------------------------|
| 1.      | N. D. Bhatt           | Engineering Drawing                        | Charotar Publishing House 2010    |
| 2.      | Amar Pathak           | Engineering Drawing                        | Dreamtech Press, 2010             |
| 3.      | D.Jolhe               | Engineering Drawing                        | Tata McGraw Hill Edu., 2010       |
| 4.      | M.B.Shah,<br>B.C.Rana | Engineering Drawing                        | Pearson, 2010                     |
| 5.      | K. Venugopal          | Engineering Drawing and Graphics + AutoCAD | New Age Publication, Reprint 2006 |
| 6.      | IS Code, SP – 46      | Engineering Drawing Practice               | --                                |

**b) Web References:**

- 1) <http://www.design-technology.info/IndProd/drawings/>
- 2) <http://graphicalcommunication.skola.edu.mt/syllabus/engineering-drawing/>
- 3) [http://en.wikipedia.org/wiki/Engineering\\_drawing](http://en.wikipedia.org/wiki/Engineering_drawing)
- 4) <http://www.engineeringdrawing.org/>
- 5) [http://www.teachengineering.org/view\\_activity](http://www.teachengineering.org/view_activity)
- 6) [www.howtoread.co.in/2013/06/how-to-read-ed.html](http://www.howtoread.co.in/2013/06/how-to-read-ed.html)
- 7) <http://www.slideshare.net/akhilrocker143/edp>
- 8) <http://www.24framesdigital.com/pstulpule>

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**COURSE ID :**

**Course Name** : APPLIED MECHANICS. (CE/ME/EE/MT)  
**Course Code** : CCG110  
**Course Abbreviation** : GAPM

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s)** : <nil >

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                       | Total |
|-----------------------|---------------------------------------|---|---------------------------------|-----------------------|-------|
|                       | Theory                                | Practical   | Theory Examination              | Practical Examination |       |
| Details of Evaluation | Average of two tests of 20 marks each | i. 25 marks for each practical<br>ii. One PR End Exam of 25 marks | Term End Theory Exam (03 hours) | As per Proforma-II    |       |
| Marks                 | 20                                    | --  | 80                              | 25 I                  | 125   |

**RATIONALE :**

Applied mechanics mainly deals with engineering problems regarding equilibrium and motion of material bodies under the action of mechanical and gravitational forces. As most branches of engineering come across situations involving bodies subjected to mechanical and gravitational forces, this course becomes one of the basic courses in engineering.

**COMPETENCY**

Apply principles of applied mechanics to solve engineering problems as follows:

**Cognitive** :Understanding and applying principles of mechanics to engineering problems

**Psychomotor** :i) Operating simple lifting machines ii) drawing graphic constructions

**Affective** :Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

**COURSE OUTCOMES :**

- CCG110-1 Determine resultant of coplanar force systems
- CCG110-2 Solve problems on bodies in equilibrium with and without friction
- CCG110-3 Solve problems on statics graphically
- CCG110-4 Solve problems on centre of gravity of laminas and solids
- CCG110-5 Solve problems on motion using kinematic and kinetic equations
- CCG110-6 Solve problems on simple lifting machines

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ **Note : Correlation levels** : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation

| Competency and COs  | Programme Outcomes Pos and PSOs               |                          |  |   |   |                            |                            |                         |                                      |                                  |
|---|---|--------------------------|--|---|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|   | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design /development of solutions | PO 4<br>Engineering Tools experimentation and testing | PO 5<br>Engineering practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of applied mechanics to solve engineering problems. | 2   | 2                        | 2  | 2   | -   | -                          | 2                          | 1                       | -                                    | -                                |
| <b>CCG110-1</b> Determine resultant of coplanar force systems                           | 3   | 1                        | 1  | 2   | -   | -                          | 2                          | 1                       | -                                    | -                                |
| <b>CCG110-2</b> Solve problems on bodies in equilibrium with and without friction       | 3   | 1                        | 1  | 2   | -   | -                          | 2                          | 1                       | -                                    | --                               |
| <b>CCG110-3</b> Solve problems on statics graphically                                   | 2   | 1                        | 1  | -   | -   | -                          | 1                          | 1                       | -                                    | -                                |
| <b>CCG110-4</b> Solve problems on centre of gravity of laminas and solids               | 3   | 1                        | 1  | 1   | -   | -                          | 2                          | 1                       | -                                    | -                                |
| <b>CCG110-5</b> Solve problems on motion using kinematic and kinetic equations          | 3   | 1                        | 1  | -   | -   | -                          | 2                          | 1                       | -                                    | --                               |
| <b>CCG110-6</b> Solve problems on simple lifting machines                               | 2   | 1                        | 1  | 2   | -   | -                          | 1                          | 1                       | -                                    | -                                |

**PRACTICAL WORK**

**Practical Exercises and related skills to be developed :**

The following practical exercises shall be conducted as Practical Work as detailed in the *Laboratory Manual for Applied Mechanics* developed by the Institute in practical sessions of batches of about 22 students:

| Sr No. | Title of Practical Exercise  | Skills / Competencies to be developed   | Course Outcome             |
|--------|--|---|----------------------------|
| 1      | Collection and presentation of four photos/graphics/ videos on field applications of mechanics   | 1. Information collection and presentation<br>2. Motivation through field exposure<br>3.  | CCG110-1<br>to<br>CCG110-6 |
| 2      | <b>Experiments on equilibrium of bodies :</b> ( <i>any six</i> )<br>1. Verification of law of polygon of forces<br>2. Verification of law of parallelogram of forces<br>3. Verification of Varignon's theorem of moments for non-concurrent force system<br>4. Verification of Lami's theorem<br>5. Determination of reactions of beam<br>6. Determination of coefficient of friction and verification of laws of friction<br>7. Determination of centroid and centre of gravity | 1. Self learning ability using laboratory manual<br>2. Measuring dimensions and angles<br>3. Applying concepts studied<br>4. Plotting and interpreting graphs<br>5. Drawing real view diagrams of machine<br>6. Time management and team working skills<br>7. Presentation skills   | CCG110-2<br>CCG110-4       |
| 3      | <b>Experiments on simple lifting machines:</b> ( <i>any four</i> )<br>1. Study of differential axle and wheel<br>2. Study of simple screw jack<br>3. Study of worm and worm wheel<br>4. Study of single gear crab<br>5. Study of double gear crab<br>6. Study of Weston's differential pulley block<br>7. Study of two sheaves and three sheaves pulley block<br>8. Study of worm geared pulley block  | 1. Studying mechanism of machine<br>2. Deriving expression for velocity ratio of machine<br>3. Measuring dimensions of machine parts using thread, etc.<br>4. Taking readings of loads and efforts<br>5. Plotting and interpreting graphs<br>6. Drawing real view diagrams of machine<br>7. Time management, team working and presentation skills | CCG110-6                   |
| 4      | <b>Graphic Statics :</b><br>One problem each<br>i) To determine resultant concurrent force system<br>ii) To determine resultant parallel force system<br>iii) To determine resultant non-current non-parallel force system<br>iv) To determine Equilibrium force of any one force system   | 1. Planning paper space<br>2. Choice of proper scale<br>3. Drawing and presentation skills<br>4. Applying concepts studied  | CCG110-3                   |
| 13     | <b>Graphic Statics :</b> Four problems to determine Reactions of beam  |   | CCG110-3                   |

|    |                         |  |  |
|----|-------------------------|--|--|
| 14 | Pictorial Question Quiz |  | CCG110-1<br>CCG110-2<br>CCG110-4<br>CCG110-5<br>CCG110-6 |
|----|-------------------------|--|--|

**A) INDUSTRIAL EXPOSURE :**

(Included in *Laboratory Manual for Applied Mechanics*)

| SN | Mode of Exposure                     | Topic                            |
|----|--------------------------------------|----------------------------------|
| 1. | Field examples of course application | Every chapter of theory syllabus |
| 2. | Field examples of course application | Practical -work assignment       |

**ASSESSMENT CRITERIA FOR PRACTICAL WORK AND PRACTICAL EXAMINATION**

**e) Assessment Criteria for practical work :**

**i) Continuous Assessment of Practical Assignments:**

Every practical assignment shall be assessed for 50 marks as per following criteria :

| Domain       | Particulars                | Marks out of 50 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 05              |
|              | Application                | 05              |
| Psychomotor  | Operating Skills           | 10              |
|              | Drawing / drafting skills  | 10              |
| Affective    | Discipline and punctuality | 10              |
|              | Decency and presentation   | 10              |
| <b>TOTAL</b> |                            | <b>50</b>       |

**ii) Practical Exam:**

One end-term Practical Exam of 25 marks shall be conducted.

Final marks of practical shall be awarded as per Assessment Pro-forma II

**B) THEORY**

**Section-I**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <i>Course Outcome CCG110-1 Determine resultant of coplanar force systems</i>                     |  |                  |                           |
| <b>1</b>   | <p><b>Resolution and Composition of Forces</b></p> <p>1.1 Definition and meaning of the terms mechanics, applied mechanics, particle, rigid body, mass, force, weight</p> <p>1.2 Attributes of a force : Magnitude, direction, sense and position. Principle of transmissibility. Graphical representation of force</p> <p>1.3 Force systems : Definition and types of force systems like coplanar and non-coplanar. Types of coplanar force systems like concurrent, non-concurrent, parallel, non-parallel. Field examples of various force systems</p> <p>1.4 Moment of a force about a point</p> <p>1.5 Couple : properties of couple. Field examples of moments and couples</p> <p>1.6 Resolution of a force into two orthogonal and oblique components</p> <p>1.7 Composition of forces : Definition and meaning of resultant of a force system. Law of parallelogram of forces. Varignon's theorem. Determination of resultant of coplanar force systems by analytical method</p> | <b>08</b>        | <b>12</b>                 |
| <i>Course Outcome CCG110-2 Solve problems on bodies in equilibrium with and without friction</i> |  |                  |                           |
| <b>2.</b>  | <p><b>Equilibrium of Bodies</b></p> <p>2.1 Definition of equilibrium of a body and equilibrant. Conditions of equilibrium. Law of moments.</p> <p>2.2 Supports : Definition, types and reactions. Free-body diagrams of bodies. Field examples.</p> <p>2.3 Lami's theorem. Field examples.</p> <p>2.4 Beams : Definition, types and field examples. Types and field examples of loads. Problems on support reactions of statically determinate beams carrying concentrated loads, uniformly distributed loads and concentrated moments (analytical method)</p> <p>2.5 Statically determinate problems on bodies in equilibrium (analytical method)</p>   | <b>08</b>        | <b>12</b>                 |
| <b>3</b>   | <p><b>Friction</b></p> <p>3.1 Definition of friction. Static and dynamic friction. Laws of friction. Coefficient of friction. Angle of repose, Angle of friction. Field examples.</p> <p>3.2 Problems involving bodies on horizontal and inclined rough surfaces and ladders</p>   | <b>04</b>        | <b>10</b>                 |
| <i>Course Outcome CCG110-3 Solve problems on statics graphically</i>                             |  |                  |                           |

|          |   |           |           |
|----------|---|-----------|-----------|
| <b>4</b> | <b>Graphic Statics</b><br>4.1 Advantages and limitations of graphical methods. Bow's notation. Space diagram, vector diagram<br>4.2 Parallelogram, triangle and polygon laws of forces<br>4.3 Problems on resultant of concurrent force systems<br>4.4 Funicular polygon. Problems on resultant of non-current force systems<br>4.5 Problems on reactions of statically determinate beams with simple and hinged supports carrying concentrated loads | <b>04</b> | <b>06</b> |
|          | <b>Total</b>  | <b>24</b> | <b>40</b> |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

## Section- II

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours)                   | Theory Evaluation (Marks)          |
|--|--|------------------------------------|------------------------------------|
| <b><i>CCG110-4 Solve problems on centre of gravity of laminas and solids</i></b>   |  |                                    |                                    |
| <b>5</b>   | <b>Centroid and Centre of Gravity</b><br>5.1 Definition and field applications of centroid and centre of gravity<br>5.2 Centroid of standard line figures. Problems involving composite figures made up of standard line figures<br>5.3 Centroid of standard laminas. Problems involving composite laminas made up of standard laminas<br>5.4 Centre of gravity of standard solids. Problems involving simple composite solids made up of standard solids  | <b>08</b>                          | <b>12</b>                          |
| <b><i>Course Outcome CCG110-5 Solve problems on motion using kinematic and kinetic equations</i></b> <b><i>Rectilinear Motion &amp; Angular Motion</i></b> |  |                                    |                                    |
| <b>6</b>   | <b>Rectilinear Motion</b><br>6.1 Definition of motion, dynamics, kinematics, kinetics, displacement, speed, velocity, acceleration, motion under gravity. Simple problems with uniform acceleration. Field examples<br>6.2 Newton's laws of motion. Simple problems<br>6.3 Definition of momentum. Law of conservation of momentum. Simple problems<br><b>Angular Motion</b><br>6.4 Definition of angular motion, angular displacement, angular velocity, angular acceleration, torque, Field examples<br>6.5 Kinematic and kinetic equations of angular motion. Simple problems with uniform angular acceleration | <b>03</b><br><br><br><br><b>03</b> | <b>06</b><br><br><br><br><b>06</b> |
| <b>7</b>   | <b>Work, Power, Energy</b><br>7.1 Definition of work done by a force. Work done by torque<br>7.2 Definition of energy. Forms of energy. Law of conservation of energy. Field examples<br>7.3 Definition of power<br>7.4 Simple problems on work, power and energy  | <b>04</b>                          | <b>06</b>                          |
| <b><i>Course Outcome CCG110-6 Solve problems on simple lifting machines</i></b>  |  |                                    |                                    |



| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>8</b>  | <b>Simple Lifting Machines</b><br>8.1 Definition of simple lifting machine, load, effort, mechanical advantage, velocity ratio, efficiency at a load. Field examples<br>8.2 Law of machine, maximum mechanical advantage, maximum efficiency, reversibility or non-reversibility of a machine at a load<br>8.3 Friction in machine, ideal machine, effort lost in friction, ideal effort, ideal load<br>8.4 Problems on simple lifting machines. (Problems or questions on any particular machines are not expected; they shall be covered in practicals) | <b>06</b>        | <b>10</b>                 |
|   | <b>Total</b>  | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |

**Specification table for setting question paper for semester end theory examination :**

| Topic No.    | Name of topic                        | Distribution of marks (Cognitive level-wise) |            |              | Course Outcome | Total Marks |
|--------------|--------------------------------------|--|------------|--------------|----------------|-------------|
|              |                                      | Remember                                     | Understand | Applica-tion |                |             |
| 1            | Resolution and Composition of Forces | 02   | 02         | 08           | CCG110-1       | 12          |
| 2            | Equilibrium of bodies                | 02   | 04         | 06           | CCG110-2       | 12          |
| 3            | Friction                             | 02   | 02         | 06           | CCG110-2       | 10          |
| 4            | Graphics Statics                     | -  | 02         | 04           | CCG110-3       | 06          |
| 5            | Centroid and Centre of Gravity       | -  | 04         | 08           | CCG110-4       | 12          |
| 6            | Rectilinear Motion                   | 02   | 02         | 02           | CCG110-5       | 06          |
| 7            | Angular Motion                       | 02   | 02         | 02           | CCG110-5       | 06          |
| 8            | Work, Power, Energy                  | 02   | -          | 04           | CCG110-5       | 06          |
| 9            | Simple Lifting Machines              | 02   | 02         | 06           | CCG110-6       | 10          |
| <b>TOTAL</b> |                                      | 14   | 20         | 46           |                | 80          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

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**INSTRUCTIONAL STRATEGIES :**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL :**

**a) Books / Journals / IS Codes**

| <b>Sr. No.</b> | <b>Author</b>                | <b>Title</b>                            | <b>Publisher</b>      |
|----------------|------------------------------|---|-----------------------|
| 1.             | Dixit,Nehate,Shaikh          | Text Book on Applied Mechanics          | Vision                |
| 2.             | Sunil Deo                    | Text book on Engineering Mechanics      | Nirali                |
| 3.             | BhavikattiandRajashekharappa | Engineering Mechanics                   | Peerson               |
| 4.             | Mariam & Mariam              | Engineering Mechanics                   | John Wiley & Sons Inc |
| 5.             | Beer & Johnston              | Vector Mechanics : Statics and Dynamics | McGraw Hill Inc       |

**b) Websites**

i)[http://en.wikipedia.org/wiki/Applied\\_mechanics](http://en.wikipedia.org/wiki/Applied_mechanics)

ii)[www.nptel.ac.in](http://www.nptel.ac.in)

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**COURSE ID :**

**Course Name : WORKSHOP PRACTISES- I (CE)**  
**Course Code : CCG111**  
**Course Abbreviation : GWSA**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | NIL          | 02      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Component Details and Duration | Progressive Assessment                |                                 | Practical                       |                       | Total |
|--------------------------------|---------------------------------------|---------------------------------|---------------------------------|-----------------------|-------|
|                                | Theory                                | Practical                       | Theory                          | Practical             |       |
|                                | Average of two tests of 20 marks each | One mid-term Skill Test (2 hrs) | Term End Theory Exam (03 hours) | As per Pro-forma - II |       |
| Marks                          | NIL                                   | --                              | --                              | 50 I                  | 50    |

**RATIONALE :**

Workshop machines mainly deals with various trades such as welding, plumbing and black smithy. The workshop practices are commonly used in Engineering Industry. A technician has to work in such environment with his peers, superiors and subordinates for a major part of his life. Therefore the emphasis on the practical work is needed for the primary experience of working in the team.

**COMPETENCY :**

**Prepare a simple job using welding, plumbing and smithy**

**Cognitive :** Understand various trade practices in civil engineering.

- Psychomotor :**
- i) Prepare job in pipe fitting.
  - ii) Prepare article consisting simple fabrication.
  - iii) Prepare job in black smithy.

**Affective :** Develop attitude of i) Interpret drawing ii) Safety

**COURSE OUTCOMES :**

**CCG 111-1** Select different types of tools used in workshop.

**CCG 111-2** Preparing simple components in workshop.

**CCG 111-3** Interpret drawing.

**CCG 111-4** Practicing safety in workshop.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs | Programme Outcomes POs and PSOs                 |                          |  |  |   |                            |                            |   |  |   |
|--------------------|---|--------------------------|--|--|---|----------------------------|----------------------------|---|--|---|
|                    | PO 1<br>Basic and discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design /development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO 1<br>Plan for collection of Data, Prepare, Design, Drawing & Estimate | PSO 2<br>Develop Supervisory, & Middle Level Management Skills | PSO 3<br>Identify and solve problems on construction sites. |
| <b>Competency:</b> | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2  | -   |
| <b>CCG111-1</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2  | -   |
| <b>CCG111-2</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2  | -   |
| <b>CCG111-3</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2  | -   |
| <b>CCG111-4</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2  | -   |

1) **Course Contents :- PRACTICAL**

| Sr. No. | Topics/ Sub-Topics  | Practical (Hours)/ Evaluation(Marks) | Skills/ Competencies to be developed  | Course outcome |
|---------|---|--------------------------------------|---|----------------|
| 1       | <b>Welding shop :-</b><br>a) Demonstration of various welding tools, joints of metals, type of welding machines.<br>b) Demonstration of arc welding techniques.<br>c) How to use current setting, earthing connection etc. and any one job composite job involving Butt, Lap joint from the following pieces of work -<br>i) Window frame.<br>ii) Grill.<br>iii) Sanitary window frame.<br>iv) Supporting frame.<br>v) Stool frame.<br>vi) Bench frame etc. | 12/20                                | a) Study of welding tools, Identifying materials<br>b) Measuring dimensions<br>c) Interpretation of drawing<br>d) Operating welding machines.<br>e) Time management and observing safety habits                     | CCG111- 1 to 4 |
| 2.      | <b>Plumbing shop :-</b><br>a) Demonstration of tools. Invading pipe joint<br>b) One job involving pipe joint and fittings (Per one group of 04 students).<br>c) Job used for wash basin pipe fitting, cock fitting, coupling etc.<br>d) Demonstration of PVC pipe joint used in civil engineering works with various PVC fittings & accessories.  | 12/20                                | a) Study of plumbing tools, Identifying materials<br>b) Threading with dies on pipes.<br>c) Interpretation of drawing<br>d) Selection of Pipe joints and fittings<br>e) Time management and observing safety habits | CCG 1 to CCG 4 |
| 3.      | <b>Smithy shop :-</b><br>a) Demonstration of different forging tools.<br>b) Demonstration of different forging processes like bending the bar of various size/diameters etc.<br>c) One job like flat chisel, fan hook or any hardware item.<br><br>Note - One job of standard size (saleable/marketable article of per student)   | 08/10                                | a) Studying forging tools, Identifying materials<br>b) Measuring dimensions<br>c) Interpretation of drawing<br>d) Selection of tools<br>e) Time management and observing safety habits                              | CCG 1 to CCG 4 |

**The students will submit the following.**

- 1) Workshop record book showing the details of the job viz. Drawing, Raw material size, time required completing the job.
- 2) The journal consisting of the neat sketches, specifications use of the hand tool, and hand Operations based on the demonstration in all the trades during the practical work.

## ASSESSMENT CRITERIA FOR PRACTICAL AND PRACTICAL EXAMINATION

### f) Assessment Criteria for Practical work :

#### i) Continuous Assessment of Practical Assignments :

Every practical assignment shall be assessed for 50 marks as per following criteria :

| Domain       | Particulars                | Marks out of 50 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 05              |
|              | Application                | 05              |
| Psychomotor  | Operating Skills           | 10              |
|              | Drawing / drafting skills  | 10              |
| Affective    | Discipline and punctuality | 10              |
|              | Decency and presentation   | 10              |
| <b>TOTAL</b> |                            | <b>50</b>       |

#### ii) Progressive Skill Test:

One mid-term *Progressive Skill Test* of 50 marks shall be conducted.

Final marks of Practical shall be awarded as per *Assessment Pro-forma III*.

### Instructional Strategies:-

- 1) Demonstration during Practical.
- 2) Workshop Record Book.
- 3) Workshop Journal.

### Teaching and learning resources:-

Shop Demonstration

Hands on training on machine

### Reference Books :-

| Author                              | Title  | Publisher                                 |
|-------------------------------------|--|---|
| S. K. Hajra Chaudhary,<br>Bose, Roy | Elements of workshop Technology –<br>Volume I & II | Media Promoters and<br>Publishers limited |
| B.S. Raghuvanshi                    | Elements of workshop Technology –<br>Volume I & II | Dhanpat Rai & Co.                         |

### Websites:

- 1) <http://nptel.ac.in>
- 2) [www.egr.msu.edu/~pkwon/me478](http://www.egr.msu.edu/~pkwon/me478)

**COURSE ID :**

**Course Name : WORKSHOP PRACTICE - II (CE)**  
**Course Code : CCG115**  
**Course Abbreviation : GWSE**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CCG111**  
**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | NIL          | 02      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Component Details and Duration | Progressive Assessment                |                                 | Term End                        |                       | Total |
|--------------------------------|---------------------------------------|---------------------------------|---------------------------------|-----------------------|-------|
|                                | Theory                                | Practical                       | Theory                          | Practical             |       |
|                                | Average of two tests of 20 marks each | One mid-term Skill Test (2 hrs) | Term End Theory Exam (03 hours) | As per Pro-forma - II |       |
| Marks                          | NIL                                   | --                              | --                              | 50 I                  | 50    |

**Rational :-**

Workshop practice II mainly deals with Wood working, Fitting and Sheet Metal work.

These are commonly used in Engineering Industry. A technician has to work in such environment with his peers, superiors and subordinates for a major part of his life. Therefore the emphasis on the practical work is needed for the primary experience of working in the team.

Such working upgrades the mental and manual abilities / skills of using efficiently the basic tools in most of the industries. The students are required to supervise, maintain equipments, where he needs the knowledge of basic workshop skills such as welding, plumbing, drilling, taping, etc.

**COMPETENCY : Prepare a simple job using wood working, sheet metal and fitting technique**

**Cognitive** : Use different types of tools in sheet metal and fitting trade.

**Psychomotor** : i) Prepare simple job in wood working, sheet metal, fitting.

**Affective** : Develop attitude of i) Interpret drawing ii) Safety

**COURSE OUTCOMES :**

**CCG 115-1** Select different types of Wood working ,Sheet metal and Fitting tools.

**CCG 115-2** Prepare a simple job in Wood working, Sheet Metal, Fitting trade.

**CCG 115-3** Read and Interpret drawing.

**CCG 115-4** Adopt safe practices in all trades.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs | Programme Outcomes POs and PSOs                 |                          |  |  |   |                            |                            |   |   |   |
|--------------------|---|--------------------------|--|--|---|----------------------------|----------------------------|---|---|---|
|                    | PO 1<br>Basic and discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design /development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO 1<br>Plan for collection of Data, Prepare, Design, Drawing & Estimate | PSO 2<br>Development, Supervisory, & Middle Level Management Skills | PSO 3<br>Identify and solve problems on construction sites. |
| <b>Competency:</b> | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2   | -   |
| <b>CCG111-1</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2   | -   |
| <b>CCG111-2</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2   | -   |
| <b>CCG111-3</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2   | -   |
| <b>CCG111-4</b>    | 1   | -                        | -  | 3  | -   | -                          | -                          | -   | 2   | -   |



2) **Course Contents :- PRACTICAL**

| Sr. No. | Topics/ Sub-Topics   | Practical (Hours)/ Evaluation (Marks) | Skills/ Competencies to be developed  | Course outcome |
|---------|--|---------------------------------------|---|----------------|
| 1       | <p><b>Wood Working shop :-</b><br/>Any one composite job from the following involving different operations, joints, turning, planning, surface finishing by emery paper, varnishing etc.<br/>Window frame.<br/>Sanitary window frame of aluminum, teakwood etc.<br/>Show cases used in various building/houses etc.<br/>Notice board.<br/>Chairs.</p>  | 12/18                                 | <p>a) Study of wood working tools, Identifying materials<br/>b) Measuring dimensions<br/>c) Interpretation of drawing<br/>d) Operating planer, cutting machines and tools<br/>e) Prepare utility article<br/>f) Time management and observing safety habits</p> | CCG1 to CCG4   |
| 2       | <p><b>Sheet Metal Shop :-</b><br/>Demonstration of different sheet metal tools &amp; machines.<br/>Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, riveting etc.<br/>To select the proper gauge &amp; type of different G.I. sheets required for job undertaken.<br/>One composite job from the following -<br/>Plates used for centering.<br/>Hold Fast used for door frame.<br/>Dustbin used in civil engineering office.<br/>Bucket.<br/>Tray.<br/>Trunk.<br/>Tin Box etc.<br/>Note - Batch size should be selected depending volume of the work.</p> | 10/16                                 | <p>a) Study of sheet metal tools, Identifying materials<br/>b) Measuring dimensions<br/>c) Interpretation of drawing<br/>d) Operating sheet cutting bending machines<br/>e) Time management and observing safety habits<br/>f) Prepare utility article</p>      | CCG1 to CCG 4  |
| 3       | <p><b>Fitting Shop :-</b><br/>Demonstration of different fitting tools &amp; drilling machines &amp; power tools.<br/>Demonstration of different operations like marking filing cutting drilling tapping etc.<br/>Demonstration of bending bars.<br/>Demonstration of stirrups.<br/>One simple job in aluminum window frame.<br/>One job in stirrups.<br/>Window frame.</p>  | 10/16                                 | <p>a) Studying fitting tools, Identifying materials<br/>b) Measuring dimensions<br/>c) Interpretation of drawing<br/>d) Operating drilling, hacksaw, threading machines<br/>e) Time management and observing safety habits<br/>f) Prepare utility article</p>   | CCG1 to CCG4   |

**The students will submit the following.**

- 1) Workshop record book showing the details of the job viz. Drawing, Raw material size, time required completing the job.
- 2) The journal consisting of the neat sketches, specifications use of the hand tool, and hand operations based on the demonstration in all the trades during the practical work.

**ASSESSMENT CRITERIA FOR PRACTICAL AND PRACTICAL EXAMINATION**

**Assessment Criteria for Practical :**

**i) Continuous Assessment of Practical Assignments :**

Every practical assignment shall be assessed for 50 marks as per following criteria :

| Domain       | Particulars                | Marks out of 50 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 05              |
|              | Application                | 05              |
| Psychomotor  | Operating Skills           | 10              |
|              | Drawing / drafting skills  | 10              |
| Affective    | Discipline and punctuality | 10              |
|              | Decency and presentation   | 10              |
| <b>TOTAL</b> |                            | <b>50</b>       |

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 50 marks shall be conducted.  
Final marks of Practical shall be awarded as per *Assessment Pro-forma III*.

**Instructional Strategies :-**

- 1) Demonstration during Practicals.
- 2) Workshop Record Book
- 3) Workshop Journal.

**Teaching and learning resources:-**

Shop Demonstration  
Hands on training on machine

**Reference Books :-**

| Author                              | Title  | Publisher                                 |
|-------------------------------------|--|---|
| S. K. Hajra Chaudhary,<br>Bose, Roy | Elements of workshop Technology –<br>Volume I & II | Media Promoters and<br>Publishers limited |
| B.S. Raghuvanshi                    | Elements of workshop Technology –<br>Volume I & II | Dhanpat Rai & Co.                         |

**Websites:**

- 1) <http://nptel.ac.in>
- 2) [www.egr.msu.edu/~pkwon/me478](http://www.egr.msu.edu/~pkwon/me478)

**COURSE ID:**

**Course Name** : SPORTS & YOGA  
**Course Code** : CCG117  
**Course Abbreviation** : GSPY

**TEACHING SCHEME**

**Pre-requisite Course(s)** : <nil>

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | NIL          | 02      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation | Progressive Assessment       |           | Term End |             |    | Total |
|--------------------|------------------------------|-----------|----------|-------------|----|-------|
|                    | Theory                       | Practical | Theory   | Practical * | TW |       |
| Marks              | No Examination Course (N.A.) |           |          |             |    |       |

**RATIONALE:**

Nowadays, Yoga and Sports have become an integral part to lead healthy life. Considering the need of society and industry, this course has been designed with theoretical foundation and practical demonstration. The main objective of the course is to acquire natural tranquility and steadiness of the mind. For acquiring mastery and perfection in Yoga and Sports, consistent practice is necessary.

**COMPETENCY** : Apply principles of Yoga and Sports in daily life.

**COGNITIVE** : Understanding and applying principles of Yoga and Sports in various situations.

**AFFECTIVE**: Attitude of i) Perfection, ii) Confidence and iii) Presentation.

**PSYCHOMOTOR**: i) Use of correct Yoga posture. ii) Practice of correct breathing. iii) Practice team work.

**COURSE OUTCOMES:**

On successful completion of the course the students will be able to:

CCG117-1: Practice Physical activities and Yoga for strength, flexibility, and relaxation.

CCG117-2: Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.

CC117-3: Learn breathing exercises and healthy fitness activities

CCG117-4: Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.

CCG117-5: Perform yoga movements in various combination and forms.

CCG117-6: Assess current personal fitness levels.

CCG117-7: Identify opportunities for participation in yoga and sports activities.

CCG117-8: Develop understanding of health-related fitness components: cardio respiratory endurance, flexibility and body composition etc.

CCG117-9: Improve personal fitness through participation in sports and yogic activities.

CCG117-10: Develop understanding of psychological problems associated with the age and lifestyle.

CCG117-11: Demonstrate an understanding of sound nutritional practices as related to health and physical performance.

CCG117-12: Assess yoga activities in terms of fitness value.

CCG117-13: Identify and apply injury prevention principles related to yoga and physical fitness activities.

CCG117-14: Understand and correctly apply biomechanical and physiological principles elated to exercise and training.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ Note : Correlation levels :1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos   | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solutions | PO 4 Engineering Tools, Experimentation and Testing | PO 5 Engineering Practices for society, sustainability and Environment | PO 6 Project Management | PO 7 Life-long Learning | PSO1 | PSO2 |
|--|---|--------------------------|---|---|--|-------------------------|-------------------------|------|------|
| <b>Competency</b> Apply principles of Yoga and Sports in daily life                              | 3   | 2                        | 3   | -   | 2  | 2                       | 2                       |      |      |
| <b>CCG117-1</b> Practice Physical activities and Yoga for strength, flexibility, and relaxation. | 2   | 2                        | 2   | -   | -  | -                       | -                       |      |      |
| <b>CCG117-2</b> Learn techniques for increasing concentration and                                | 3   | 2                        | 3   | -   | 2  | -                       | 2                       |      |      |

| Competency and Cos   | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solutions | PO 4 Engineering Tools, Experimentation and Testing | PO 5<br>Engineering Practices for society, sustainability and Environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1 | PSO2 |
|--|---|--------------------------|---|---|---|----------------------------|----------------------------|------|------|
| decreasing anxiety which leads to stronger academic performance.   |   |                          |   |   |   |                            |                            |      |      |
| <b>CCG117-3</b> Learn breathing exercises and healthy fitness activities   | 2   | 2                        | 3   | -   | 2   | 2                          | 1                          |      |      |
| <b>CCG117-4</b> Understand basic skills associated with yoga and physical activities including strength and flexibility, balance & coordination. | 2   | 2                        | 2   | -   | 2   | -                          | 2                          |      |      |
| <b>CCG117-5</b> Perform yoga movements in various combination and forms.   | 2   | 2                        | 2   | -   | -   | -                          | -                          |      |      |
| <b>CCG117-6</b> Assess current personal fitness levels.  | 2   | 2                        | 3   | -   | 2   | -                          | -                          |      |      |
| <b>CCG117-7</b> Identify opportunities for participation in yoga and sports activities.  | 3   | 2                        | 3   | -   | 2   | 2                          | 2                          |      |      |
| <b>CCG117-8</b> Develop understanding of health-related fitness components: cardio respiratory endurance, flexibility and body composition etc.  | 2   | 2                        | 2   | -   | -   | -                          | -                          |      |      |
| <b>CCG117-9</b> Improve personal fitness through participation in sports and yogic activities.   | 3   | 2                        | 3   | -   | 2   | -                          | 2                          |      |      |
| <b>CCG117-10</b> Develop understanding of psychological problems associated with the age and lifestyle.  | 2   | 2                        | 3   | -   | 2   | 2                          | 1                          |      |      |
| <b>CCG117-11</b> Demonstrate an understanding of sound nutritional practices as related to health and physical performance.                      | 2   | 2                        | 2   | -   | 2   | -                          | 2                          |      |      |
| <b>CCG117-12</b> Assess yoga activities in terms of fitness value.   | 2   | 2                        | 2   | -   | -   | -                          | -                          |      |      |
| <b>CCG117-13</b> Identify and apply injury prevention principles related to yoga and physical fitness activities.                                | 2   | 2                        | 3   | -   | 2   | -                          | -                          |      |      |
| <b>CCG117-14</b> Understand and correctly apply biomechanical and physiological principles related to exercise and training.                     | 2   | 2                        | 2   | -   | -   | -                          | -                          |      |      |

**CONTENT:**

| Sr. No. | Topics / Sub-topics  |
|---------|--|
| 1       | <p><b>Introduction to Physical Education</b></p> <ul style="list-style-type: none"> <li>o Meaning &amp; definition of Physical Education</li> <li>o Aims &amp; Objectives of Physical Education</li> <li>o Changing trends in Physical Education</li> </ul>  |
| 2       | <p><b>Physical Fitness, Wellness &amp; Lifestyle</b></p> <ul style="list-style-type: none"> <li>o Meaning &amp; Importance of Physical Fitness &amp; Wellness</li> <li>o Components of Physical fitness</li> <li>o Components of Health related fitness</li> <li>o Components of wellness</li> <li>o Preventing Health Threats through Lifestyle Change</li> <li>o Concept of Positive Lifestyle</li> </ul>  |
| 3       | <p><b>Introduction to Ashtang Yog</b></p> <ul style="list-style-type: none"> <li>o Meaning &amp; Importance Yam, Niyam, Aasan, Pranayam, Pratyahar, Dharana, Dhyan &amp; Samadhi</li> </ul>  |
| 4       | <p><b>Postures</b></p> <ul style="list-style-type: none"> <li>o Meaning and Concept of Postures.</li> <li>o Causes of Bad Posture.</li> <li>o Advantages &amp; disadvantages of weight training.</li> <li>o Concept &amp; advantages of Correct Posture.</li> <li>o Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.</li> <li>o Corrective Measures for Postural Deformities</li> </ul> |
| 5       | <p><b>Yoga</b></p> <ul style="list-style-type: none"> <li>o Meaning &amp; Importance of Yoga</li> <li>o Elements of Yoga</li> <li>o Introduction - Asanas, Pranayama, Meditation &amp; Yogic Kriyas</li> <li>o Yoga for concentration &amp; related Asanas (Sukhasana; Tadasana; Padmasana &amp; Shashankasana)</li> <li>o Relaxation Techniques for improving concentration - Yog-nidra</li> </ul>  |
| 6       | <p><b>Pranayam &amp; its types</b></p>   |

|    |   |
|----|---|
|    | <ul style="list-style-type: none"> <li>o Meaning &amp; Importance of Pranayam</li> <li>o Breathing Exercises : Slow &amp; Fast, Kapalbhathi</li> <li>1.Nadishodhan (Anulom- Vilom)</li> <li>2.Sheetali</li> <li>3.Sitkari</li> <li>4.Ujjayi</li> <li>5.Bhramari</li> <li>6.Bhastrika</li> </ul>   |
| 7  | <p><input type="checkbox"/> <input type="checkbox"/> <b>Yoga &amp; Lifestyle</b></p> <ul style="list-style-type: none"> <li>o Asanas as preventive measures.</li> <li>o Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.</li> <li>o Obesity: Procedure, Benefits &amp; contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.</li> <li>o Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.</li> <li>o Diabetes: Procedure, Benefits &amp; contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.</li> <li>o Asthema: Procedure, Benefits &amp; contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.</li> </ul> |
| 8  | <p><input type="checkbox"/> <input type="checkbox"/> <b>Sun Salutation (Suryanamaskar)</b></p> <ul style="list-style-type: none"> <li>o Meaning and concept of Suryanamaskar</li> <li>o Postures</li> <li>o Use of breathing techniques and Mantras</li> </ul>  |
| 9. | <p><input type="checkbox"/> <input type="checkbox"/> <b>Yogasan</b></p> <ul style="list-style-type: none"> <li>o Meaning and Importance of Yogasan</li> <li>o Types of Yogasan : Naukasan, Dhanurasan, Garudasan, Virasan, Sarvangasan, Matsyasan, Parighasan, Ushtrasan, Hansasan &amp; Mayurasan</li> </ul>   |
| 10 | <p><input type="checkbox"/> <input type="checkbox"/> <b>Prayer</b></p> <ul style="list-style-type: none"> <li>o Meaning and Importance of Prayer</li> <li>o Omkar Chanting</li> <li>o Meditation &amp; Mudras</li> </ul>  |

|            |   |
|------------|---|
| <b>11.</b> | <p><input type="checkbox"/> <input type="checkbox"/> <b>Psychology &amp; Sports</b></p> <ul style="list-style-type: none"><li>o Definition &amp; Importance of Psychology in Physical Edu. &amp; Sports</li><li>o Define &amp; Differentiate Between Growth &amp; Development</li><li>o Adolescent Problems &amp; Their Management</li><li>o Emotion: Concept, Type &amp; Controlling of emotions</li><li>o Meaning, Concept &amp; Types of Aggressions in Sports.</li><li>o Psychological benefits of exercise.</li><li>o Anxiety &amp; Fear and its effects on Sports Performance.</li><li>o Motivation, its type &amp; techniques.</li><li>o Understanding Stress &amp; Coping Strategies.</li></ul> |
| <b>12.</b> | <p><input type="checkbox"/> <input type="checkbox"/> <b>Sports / Games</b></p> <p>Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.</p> <ul style="list-style-type: none"><li>o History of the Game/Sport.</li><li>o Latest General Rules of the Game/Sport.</li><li>o Specifications of Play Fields and Related Sports Equipment.</li><li>o Important Tournaments and Venues.</li><li>o Sports Personalities.</li><li>o Proper Sports Gear and its Importance.</li></ul>   |

**Specification table for setting question paper for semester end theory examination:**

**NO THEORY EXAMINATION**

**ASSESSMENT CRITERIA FOR PRACTICAL ASSIGNMENTS AND PRACTICAL EXAMINATION :**

**NO PRACTICAL EXAMINATION**



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**INSTRUCTIONAL STRATEGIES:**

**INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                      | Topic    |
|----|---------------------------------------|----------|
| 1. | Visit to nearest Yoga & Sports Centre | Syllabus |

**B. Instructional Methods:**

1. Lectures and Demonstrations with Practices
2. Yoga room & Ground Practices

**C. Teaching and Learning Resources:**

1. LCD Projector
2. Visual Streaming

**REFERENCE MATERIAL:**

**Books :**

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga By B.K.S. Iyengar.
3. Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority Paperback –by [B.K.S. Iyengar](#)
4. Light on the Yoga Sutras of Patanjali Kindle Edition by [B. K. S. Iyengar](#)
5. Yoga For Sports: A Journey Towards Health And Healing Kindle Edition by [BKS Iyengar](#)

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# **LEVEL II – LIFE SKILLS & PROFESSIONAL SKILLS**

**Course ID**

**Course Name : INTRODUCTION TO IT SYSTEM. ( CE/ME/EE/MT/IE/ET/IT)**

**Course Code : CCG201**

**Course Abbreviation : GITS**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : NIL**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 2            | 4       |
| Practical        | 2            |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment |  | Term End Examination |           |                                  | Total     |
|-----------------------|------------------------|--|----------------------|-----------|----------------------------------|-----------|
|                       | Theory                 | Practical  | Theory Examination   | Term Work | Practical Examination (Internal) |           |
| Details of Evaluation | --                     | 25 marks for each practical<br>One PST of 25 marks | --                   | --        | As per Proforma-II               |           |
| Marks                 | --                     | --   | --                   | --        | <b>50*I</b>                      | <b>50</b> |

**RATIONALE:**

Computers play a vital role in various fields like business, academics, defense, budget, research, engineering, medicine. In the present Industrial & commercial environment, the technician is expected to use computers skilfully.

This course is intended to make students comfortable with computing environment - Understanding Computer Hardware, Learning basic computer skills, basic application software tools, basic knowledge and applications of Internet and Cyber security awareness.

**COMPETENCY:**

**Apply Fundamental knowledge of computer system to work with simple applications.**

**Cognitive:** i) State the basic parts of a computer system and relationships among component.  
ii) Describe characteristics and functions of CPU's, motherboard, RAM, Storage devices

**Psychomotor:** i) Identify computer system and Network ii) Create word documents, spreadsheets and presentation

**Affective: Attitude** of i) Precision ii) Accuracy iii) Safety iv) Punctuality

**COURSE OUTCOMES:**

**CCG201-1:** State basic components & applications of a computer system.

**CCG201-2:** Classify system and application software of a computer system.

**CCG201-3:** Design files of word processors, spreadsheets, presentation software, and database application

**CCG201-4:** Describe importance of Internet and cyber law.

**COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| PO<br>→  | PO 1                                    | PO 2             | PO 3                            | PO 4   | PO 5  | PO 6               | PO 7              | PS O 1                 | PS O 2                          |
|--|---|------------------|---------------------------------|--|---|--------------------|-------------------|------------------------|---------------------------------|
| CO<br>↓  | Basic and discipline specific knowledge | Problem Analysis | Design/Development of solutions | Engineering Tools, experimentation and testing | Engineering practices for society, sustainability and environment | Project Management | Lifelong Learning | Design and development | Database and Network management |
| <b>COMPENTENCY-Apply Fundamental knowledge of computer system to work with simple applications</b> | 3                                       | 1                | 3                               | 2  | 2   | 1                  | 3                 | 2                      | 1                               |
| CCG201-1   | 3                                       | 0                | 0                               | 2  | 1   | -                  | 2                 | -                      | -                               |
| CCG201-2   | 3                                       | 1                | 0                               | 2  | 1   | 0                  | 2                 | -                      | -                               |
| CCG201-3   | 3                                       | 3                | 3                               | 3  | 2   | 1                  | -                 | 2                      | 1                               |
| CCG201-4   | 3                                       | 0                | 0                               | 2  | 3   | -                  | 3                 | -                      | 1                               |

**Laboratory Work:**

**Laboratory experiments and related skills to be developed:**

| Sr. No. | Title of Experiment  | Skills to be developed   | Course outcome         |
|---------|--|--|------------------------|
| 1.      | Identify system unit, connections of internal components and input/output devices. | <ul style="list-style-type: none"> <li>. Identify different components inside the CPU cabinet.</li> <li>. Identify input/output and storage devices..</li> </ul>   | CCG201-1               |
| 2.      | Manage files and folders.  | <ul style="list-style-type: none"> <li>. Create, copy, rename, delete, move files and folders.</li> </ul>  | CCG201-1               |
| 3.      | Install and configure device driver for printer and scanners                       | <ul style="list-style-type: none"> <li>. Install driver software for a printer, Scanner</li> <li>. Set up a printer &amp; scanner</li> <li>. Scan a page, print a test page</li> </ul>   | CCG201-1 &<br>CCG201-2 |
| 4.      | Identify configuration of OS & Computer system.                                    | <ul style="list-style-type: none"> <li>. Understanding the concept of system and application software.</li> <li>. Use start icon, taskbar, Recycle Bin, My Computer icon, The Recycle Bin and deleted files</li> <li>. Creating shortcuts on the desktop</li> </ul>  | CCG201-2               |
| 5.      | Creating and Editing a word document   | <ul style="list-style-type: none"> <li>. Use of menus and submenus.</li> <li>. Type and format the text matter in paragraphs.</li> <li>. Set up page size, margins</li> <li>. Insert headers and footers, bullets.</li> <li>. Use of borders and shading</li> <li>. Format picture, word-art, text box etc.</li> <li>. Typing text in multi-columns</li> <li>. Use of equation editor</li> </ul> | CCG201-3               |
| 6.      | Inserting table and Mail-Merge   | <p>Table:</p> <ul style="list-style-type: none"> <li>. Insert, format Table.</li> <li>. Sort data in table</li> </ul> <p>Mail-Merge:</p> <ol style="list-style-type: none"> <li>1. Create main document and data source</li> <li>2. Merge the main document and data source.</li> <li>3. Merge to file and merge to print.</li> </ol>  | CCG201-3               |
| 7.      | Creating and Editing a Spreadsheet   | <ul style="list-style-type: none"> <li>. Use of menus and submenus.</li> <li>. Creating a table in worksheet.</li> <li>. Insert formulas, IF condition and functions.</li> <li>. Apply sort, filter and data validations.</li> <li>. Set up page size, margins. &amp; set the print area.</li> </ul>   | CCG201-3               |
| 8       | Creating and editing a presentation.   | <ul style="list-style-type: none"> <li>. Insert new / duplicate slides</li> </ul>  | CCG201-3               |

|    |   |   |                |
|----|---|---|----------------|
|    |   | <ul style="list-style-type: none"> <li>. Create objects on a slide and use general editing operations.</li> <li>. Use of different views in presentation</li> <li>. Apply standard templates for slides.</li> <li>. Use preset animation, slide transition and Prepare speaker notes.</li> </ul>    |                |
| 9  | Apply advance features of slide-show              | <ol style="list-style-type: none"> <li>1. Use of custom animation effect</li> <li>2. Use of action buttons on slides</li> <li>3. Rehearse time-setting of slide show</li> </ol>   | CCG201-3       |
| 10 | Internet Basics                                   | <ul style="list-style-type: none"> <li>. Check internet connections &amp; its properties.</li> <li>. Configure Browser settings and use browser.</li> <li>. Use search engines.</li> <li>. Visit various website ,Digital India portals (state and national portals) and college portals</li> </ul> | CCG201-4       |
| 10 | Making use of Internet (Email, virus protection.) | <ul style="list-style-type: none"> <li>. Register for e-mail ID.</li> <li>. Communicate with others using e-mail</li> <li>. Installation, use of Anti-virus software,</li> </ul>  | CCG201-4       |
| 11 | Mini Project                                      | Mini Project based presentation, database & spreadsheet handling, word processing skills.   | CCG201-1 to -4 |

**CONTENT:**

| Sr. No.  | Topics / Sub-topics   | Lectures (Hours) |
|--|---|------------------|
| <i>CCG201-1: State basic components &amp; applications of a computer system.</i> |   |                  |
| <b>1</b>   | <p><b>INTRODUCTION TO COMPUTERS</b></p> <p><b>1.1 Introduction to Information Technology</b></p> <p><b>1.2 Basic computer components:-</b>Block of Computer System, I/O Unit, CPU, ALU, Memory Unit.</p> <p><b>1.3 Internal System Components:-</b> Processor, Motherboards, RAM, ROM,Graphics Cards, Sound Cards, HDD, SSD(Introduction to latest devices for all above points)</p> <p><b>1.4 External System Components:-</b> Introduction to <u>Input Devices</u>-Keyboards, mouse, joystick, pen , scanners, (Introduction to latest types )</p> <p><u>Output Devices</u>-Monitors, Projectors, Speakers, Printers (Introduction to latest types)</p> <p><b>1.5 Secondary Storage Devices:-</b> CD/DVD , USB/ Flash Dives, External Hard Disks (Introduction to latest types)</p> <p><b>1.6 Applications of IT</b> –Education, Medical, ,Computer application in Offices, data analysis ,accounting, Investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, design and research work, financial transaction terminals.</p> | 6                |

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) |
|--|--|------------------|
| <b>CCG201-2: Classify system and application software of a computer system.</b>                                  |  |                  |
| 2  | <b>INTRODUCTION TO SOFTWARE</b><br><b>2.1 Types of software</b><br><b>2.1.1 System software</b> – Introduction to Operating System (Various Examples of Desktop and Mobile Operating Systems), Device Drivers, Device Manager<br><b>2.1.2 Application Software:</b> Terminology, Examples – Word Processing, Spreadsheets, Presentation tool, Image & Video Editing Software, Database Management applications   | 4                |
| <b>CCG201-3: Design files of word processors, spreadsheets, presentation software, and database application.</b> |  |                  |
| 3  | <b>WORD PROCESSING AND SPREAD SHEETS:</b><br><b>3.1 Creating and Editing a Document</b><br>3.1.1 Changing Layout of a Document (Design, Margins, Page Orientation, Borders, Themes, Watermark)<br>3.1.2 Inserting Elements to Word Documents (Shapes Charts, Image, Header Footer, Page number)<br>3.1.3 Working with Tables<br>3.1.4 Mail Merge<br><b>3.2 Creating and Editing a Spreadsheet</b><br>3.2.1 Changing Layout of a Spreadsheet (Design, Margins, Page Orientation, Borders,)<br>3.2.2 Inserting Elements to Spreadsheet (Shapes Charts, Image, Header Footer, Page number)<br>3.2.3 Working with Formulas and Data Validation<br>3.2.4 Working with Sorting and Filtering | 8                |
| 4  | <b>PRESENTATION AND DATABASE:</b><br><b>4.1 Creating and Editing a Presentation</b><br>4.1.1 Changing Layout of a Presentation (Slide Design, Orientation, Themes, Animation)<br>4.1.2 Inserting Elements to Presentation (Shapes Charts, Image, Header Footer, Page number)<br>4.1.3 Preparing Slide Show<br><b>4.2 Creating and Editing a Database</b>   | 6                |
| <b>CCG201-4: Describe importance of Internet and cyber laws.</b>   |  |                  |
| 5  | <b>COMPUTER NETWORKS</b><br>5.1 Basic elements of a communication system<br>5.2 Introduction to Digital & Analog data<br>5.3 Types of Networks : LAN, MAN, WAN<br>5.4 Virus, Types of Viruses, Virus Protection  | 4                |
| 6  | <b>INTERNET &amp; CYBER LAWS</b><br>6.1 Internet basic terminology – Web page, Web site, WWW, HTTP, HTML,<br>6.2 Client, server concepts<br>6.3 Introduction to ISP with example<br>6.4 Various examples of Browsers, Search Engines<br>6.5 Awareness about Digital India portals (state and national portals) and college portals.<br>6.6 Introduction to Cyber Law<br>6.7 Information Technology Act of India 2000, 2008   | 4                |

**Progressive Skills Test :**

**Criteria for Continuous Assessment of Practical work and Progressive skill Test:**

| <b>Sr. no</b> | <b>Criteria</b>                               | <b>Marks allotted</b> |
|---------------|---|-----------------------|
| 1             | Attendance at regular practical               | 05                    |
| 2             | Preparedness for practical                    | 02                    |
| 3             | Neat & complete Diagram.                      | 04                    |
| 4             | Observations & computer handling skill        | 02                    |
| 5             | Use of toolbar, menu bar and short cut keys.  | 04                    |
| 6             | Logical thinking and approach                 | 04                    |
| 7             | Oral Based on Lab work and completion of task | 04                    |
| <b>TOTAL</b>  |   | <b>25</b>             |

Assessment at semester end practical exam as per Pro-forma II.

**Criteria for assessment at semester end practical exam:**

| <b>Sr. no</b> | <b>Criteria</b>     | <b>Marks allotted</b> |
|---------------|---------------------|-----------------------|
| 1.            | Technical ability   | 20                    |
| 2.            | Communication skill | 10                    |
| 3.            | Logical approach    | 20                    |
| <b>TOTAL.</b> |                     | <b>50</b>             |

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Discussions
2. Regular Home Assignments.
3. Laboratory experiences and laboratory interactive sessions



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**Teaching and Learning resources**

1. Chalk board 2.Slides (PPT) 3. Self-learning Online Tutorials

**REFERENCE MATERIAL:**

**a) Books / Codes**

| <b>Sr. No.</b> | <b>Author</b> | <b>Title</b>                              | <b>Publisher</b>                   |
|----------------|---------------|---|------------------------------------|
| 1.             | Sanjay Saxena | A first course in Computers 2003 edition  | Vikas Publishing House Pvt Limited |
| 2.             | Anita Goel    | Computer Fundamentals                     | Pearson Education India            |
| 3.             | Sudipto Das   | A Complete Guide to Computer Fundamentals | Laxmi Publications                 |
| 4.             | P.K.Sinha     | Computer Fundamentals                     | BPB Publication                    |

**b) Websites**

- i) [https://www.tutorialspoint.com/computer\\_fundamentals/index.htm](https://www.tutorialspoint.com/computer_fundamentals/index.htm)
- ii) <http://kvsecontents.in/computer-fundamentals>
- iii) <https://www.javatpoint.com/computer-fundamentals-tutorial>
- iv) [https://www.tutorialspoint.com/information\\_security\\_cyber\\_law/quick\\_guide.htm](https://www.tutorialspoint.com/information_security_cyber_law/quick_guide.htm)
- v) [https://www.tutorialspoint.com/internet\\_technologies/internet\\_overview.htm](https://www.tutorialspoint.com/internet_technologies/internet_overview.htm)

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**Course ID:**

**Course Name : Fundamentals of Electrical and Electronics Engineering. (CE)**

**Course Code : CCG202**

**Course Abbreviation : GEEE**

**TEACHING AND EVALUATION SCHEME:**

**Prerequisites: NIL**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 2            | 4       |
| Practical        | 2            |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment |   | Term End Examination |           |                                     | Total |
|-----------------------|------------------------|---|----------------------|-----------|-------------------------------------|-------|
|                       | Theory                 | Practical   | Theory Examination   | Term Work | Practical Examination               |       |
| Details of Evaluation | -                      | 25marks for each practical<br>One PST of 25 marks | -                    | -         | Internal Practical Exam Proforma II |       |
| Marks                 | -                      | ---   | -                    | -         | 50* I                               | 50    |

I-Internal Examination

**RATIONALE:**

To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Digital Electronics and their applications to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

**COMPETENCY:**

Understanding and visualizing electrical equipments and electronic circuits and devices.

**Cognitive:** Acquire basic knowledge of electrical and electronics and its different applications.

**Psychomotor:** Should be able to handle different electrical and electronic elements and components

**Affective:** Attitude of i) Logic ii) Accuracy iii) Precision iv) Punctuality

**COURSE OUTCOMES:**

**CCG202 -1.** Analyse DC and AC circuits and applications of series and parallel circuit.

**CCG202 -2.** Analyse and maintain different power generating stations.

**CCG202 -3.** Use of electrical machines for different applications.

**CCG202-4.** Illustrate the use of components based on the functions and the specifications in the problem solving.

**CCG202-5.** Analyze different Logic families & working of logic gates to select in solution of problems.

**CCG202-6.** Identify different topologies and models of network and illustrate its functioning based on connecting devices.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ Note : Correlation levels :1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos   | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, experimentation and testing | PO 5<br>Engineering practice for society, sustainability, Environment | PO 6<br>project management | PO 7<br>Life-long learning | PSO 1<br>Operate and Maintenance | PSO 2<br>Supervision and Providing Solution |
|--|---|--------------------------|---|--|---|----------------------------|----------------------------|----------------------------------|---|
| Competency: Understanding and visualizing electrical equipments and electronic circuits and devices. | 2   | 2                        | 2                                       | -  | -   | -                          | -                          | 3                                | 2   |
| CCG202-1   | 2   | 1                        | 1                                       | 2  | -   | -                          | -                          | -                                | -   |
| CCG202-2   | 2   | 1                        | 1                                       | 2  | -   | -                          | -                          | -                                | -   |
| CCG202-3   | 2   | 1                        | 1                                       | 2  | -   | -                          | -                          | -                                | -   |
| CCG202-4   | 1   | 3                        | 3                                       | 2  | -   | -                          | -                          | 3                                | 2   |
| CCG202-5   | 1   | 3                        | 3                                       | 2  | -   | -                          | -                          | -                                | -   |
| CCG202-6   | 1   | 2                        | 2                                       | 2  | -   | -                          | -                          | -                                | -   |

**A) Laboratory experiments and related skills to be developed:**

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed  | Course Outcome |
|--------|---|--|----------------|
| 1      | To measure the voltage, current and power in an electrical circuit.             | To understand the connections of different meters in electrical circuit.   | CCG202-1       |
| 2      | To calculate the total equivalent resistance of a parallel circuit.             | To understand the concept of a parallel circuit.   | CCG202-1       |
| 3      | To study the fluorescent tube circuit.  | Know the connection and working of a fluorescent tube.   | CCG202-2       |
| 4      | To find the transformation ratio of a single phase transformer.                 | To identify the windings of transformer.   | CCG202-3       |
| 5      | Start and reverse the direction of Three Phase Induction Motor.                 | To study the starting and reversing of an Induction Motor.   | CCG202-3       |
| 6      | Identify various passive electronic components in the given circuit             | To identify different types of passive electronic components   | CCG202-4       |
| 7      | Identify various active electronic components in the given circuit              | To identify different types of active electronic components  | CCG202-4       |
| 8      | Use multimeter to measure the value of given resistor.                          | To identify different types of resistor.<br>Measure resistor on multimeter   | CCG202-4       |
| 9      | Test the PN-junction diodes using digital multimeter                            | Test the s PN-junction diodes<br>Measure PN-junction diodes on multimeter  | CCG202-4       |
| 10     | TDR ,LDR  | Testing of TDR ,LDR  | CCG202-4       |
| 11     | To plot the characteristics of RTD  | Connect power supply<br>Know the front panel<br>Plot the characteristics of RTD  | CCG202-4       |
| 12     | To measure displacement using LVDT  | Connect power supply<br>Know the front panel<br>Plot the graph of actual displacement v/s reading obtained<br>Comment on the linearity | CCG202-4       |
| 13     | Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX- NOR gates . | Connect circuit as per diagram<br>Check truth table using multimeter   | CCG202-5       |
| 14     | Verification of truth tables of   | Connect power supply   | CCG202-5       |

|    |  |  |          |
|----|--|--|----------|
|    | Flipflops - JK, RS, T and D            | Connect clock circuit<br>Check truth table using LEDs  |          |
| 15 | PING command                           | Interpret various responses of PING command.   | CCG202-6 |
| 16 | Peer to Peer network<br>Implementation | Understand installation of NIC Driver and<br>Assign IP address, name to node and Share<br>resources like Drives, Folder. | CCG202-6 |

### Section-I

| Sr. No.   | Topics   | Teaching hours | Marks |
|---|--|----------------|-------|
| CCG202 -1 Analyse DC and AC circuits and applications of series and parallel circuit. |  |                |       |
| 1.  | Fundamentals of an electrical engineering.<br>1.1 Concept of voltage, EMF, potential and potential difference, current, power and energy.<br>1.1 DC and AC system, different terms used in AC system viz. sinusoidal ac current, RMS value, frequency, power factor, etc.<br>1.2 Simple series and parallel circuit.<br>1.3 Study of different types of electrical meters.   | 5              | --    |
| CCG202 -2 Analyse and maintain different power generating stations.                   |  |                |       |
| 2.  | Introduction to power generation and wiring.<br>2.1 Different types of power substation, their block diagram and working in brief.<br>2.2 Electrical transmission and distribution system, single line diagram, their important components.<br>2.3 Necessity of High Voltage transmission.<br>2.4 Electrical wiring tools, switches--surface, flush, Rotary, knife, ICDP and ICTP, sockets and holders, wires and cables, etc.<br>2.6 PVC casing capping wiring, conduit wiring.<br>2.7 Introduction to different types of lamps and LED bulb. | 6              | --    |
| CCG202 -3 Use of electrical machines for different applications.                      |  |                |       |
| 3.  | Introduction to Electrical machines.<br>3.1 Single phase and three phase induction motor, squirrel cage and slip ring induction motors, brief introduction to single phase motors.<br>3.2 Study of transformer, construction and working, step up and step down transformer, KVA rating.<br>3.3 Fundamentals of alternators.   | 5              | --    |

## Section II

| Sr. No.  | Topics   | Teaching hours | Marks |
|--|--|----------------|-------|
| CCG202-4 Illustrate the use of components based on the functions and the specifications in the problem solving.          |  |                |       |
| 4  | Overview of Electronic Components<br>4.0 Components-discrete, non-discrete, Active, passive components.<br>4.1 Definition and symbol of passive components:- Resistors, Capacitor, Inductor<br>4.2 Definition and symbol of active components:- Diode, Transistor<br>4.3 Functions and symbol of relay<br>4.4 Introduction of Cables and Connectors<br>Definition of Transducers<br>4.5.1 Introduction of TDR, LDR<br>4.5.2 Types of Transducers: - Resistance temperature detector (RTD), Linear variable differential transformer (LVDT), Strain gauge, Piezo electric transducer. | 5              | --    |
| CCG202-5 Analyze different Logic families & working of logic gates to select in solution of problems.                    |  |                |       |
| 5  | <b>Overview of Digital Electronics:</b><br>5.0 Binary Number systems<br>5.1 Introduction of Logic gates : Symbol, Truth table, logical equation & TTL IC's<br>5.3 Basic Boolean Laws & Implementation of Boolean expressions<br>5.4 Flip flops – RS, JK, T and D.<br>5.5 Sequential logic circuits – Ripple counters, UP/DOWN, Decade counter and 3-bit shift registers (Right & Left).  | 5              | ---   |
| CCG202-6 Identify different topologies and models of network and illustrate its functioning based on connecting devices. |  |                |       |
| 6.   | <b>Overview of communication systems</b><br>6.1 Communication system – Analog( AM & FM modulation) and Introduction of PAM & PWM<br>6.0 Wired and wireless channel. Block diagram of various communication systems<br>6.2 Introduction of cellular mobile system.<br>6.3 Network model & Topologies– LAN, MAN and WAN – Circuit and packet switching<br>6.4 Network Devices: Network Connectors, Hubs, Switches, Routers, Bridges  | 6              | ---   |
|  | Total  | 32             |       |

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## ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION

### Assessment Criteria

#### i) Continuous Assessment of Practical Assignments:

Every practical assignment shall be assessed for 25 marks as per given criteria.

#### ii) Progressive Skill Test :

One mid-term Progressive Skill Test of 25 marks shall be conducted as per criteria given below  
Criteria for Continuous Assessment of Practical work and Progressive skill Test

| Sr. No. | Criteria  | Marks allotted |
|---------|---|----------------|
| 1       | Neat & complete circuit Diagram / schematic Diagram.    | 10             |
| 2       | Observations & Result Table                             | 10             |
| 3       | Sample Calculations with relevant Formulae.             | 10             |
| 4       | Proper Graphs & Procedure / workmanship Safety measures | 10             |
| 5       | Oral Based on Practicals                                | 10             |
|         | Total   | 50             |

### INSTRUCTIONAL STRATEGIES :

#### Instructional Methods :

1. Lectures cum Discussions    2. Regular Home Assignments.    3. Laboratory work

#### Teaching and Learning resources:

1. Chalk board    2. Video clips    3. Slides    4. Item Bank    5. Charts

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## REFERENCE MATERIAL

### a) Books / Codes

| Sr.No. | Author                         | Title  | Publisher                                     |
|--------|--------------------------------|--|---|
| 1      | Theraja, B. L.                 | Electrical Technology Vol – I                          | S. Chand Publications, New Delhi              |
| 2      | Theraja, B. L.                 | Electrical Technology Vol – II                         | S. Chand Publications, New Delhi              |
| 3      | Dhir                           | Electronic Components and Materials                    | Tata McGraw Hill                              |
| 4      | V K Mehta                      | Principles of Power System                             | S. Chand Publications, New Delhi              |
| 5      | K B Raina and S K Bhattacharya | Electrical Design Estimating and Contracting           | New Age International                         |
| 6      | Grover &Jamwal                 | Electronic Components and Materials                    | Dhanpat Rai & Sons,                           |
| 7      | Madhuri Joshi                  | Electronic Components and Materials                    | Shroff Publishers & Distributors private ltd. |
| 8      | Malvino and Leach              | Digital Principles and Applications:                   | Tata McGraw-Hill                              |
| 9      | R. P. Jain                     | Modern Computer Fundamentals                           | Tata McGraw-Hill                              |
| 10     | A. K. Sawaney.                 | Electrical & Electronics Measurement & Instrumentation | Dhanpat Rai Publications                      |
| 11     | B.A. Forouzan                  | Data Communication &Networking                         | Tata McGraw-Hill Edition(4th Edition)         |

### b)Websites:

<http://www.electronica-india.com/>

<http://electronicsclub.info/>

<http://nptel.ac.in>



**COURSE ID:**

**Course Name** : COMMUNICATION SKILLS  
**Course Code** : CCG203  
**Course Abbreviation** : GCMS

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : <nil >

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation           | Progressive Assessment  |                                | Term End                        |                                    |                     | Total      |
|------------------------------|---|--------------------------------|---------------------------------|------------------------------------|---------------------|------------|
|                              | Theory  | Practical                      | Theory                          | Practical *                        |                     |            |
| <b>Details of Evaluation</b> | Average of two tests of 20 marks each to be converted out of 10 marks | One Mid-Term Skill Test(2 hrs) | Term End Theory Exam (02 hours) | Term End Practical Exam (02 hours) | As per Proforma II. |            |
| <b>Marks</b>                 | <b>10</b>   | <b>--</b>                      | <b>40</b>                       | <b>50 I</b>                        | <b>--</b>           | <b>100</b> |

\* *Practical Examination to be conducted by internal examiner (course teacher) and external examiner (course teacher of different class from the Institute) and marks to be entered as per Proforma II.*

**RATIONALE:**

Communication being an integral part of every personal and professional human activity, communication skills plays a fundamental role in education as well as technology. As a unanimous feedback from the industry in general, technicians need to be specially strengthened in communication skills for their effectiveness in profession and career. Considering the age group and socio-economical background of the students of the Institute, this course has been designed with a skill-oriented content with some necessary theoretical foundation. For mastery and perfection in these skills, consistent practice and integrated application is necessary in all subjects of the Programme.

**COMPETENCY :**

Apply principles of communication to communicate in formal and informal scenario as follows:

**Cognitive :** Understanding and applying principles of communication in various situations

**Affective :** Attitude of i) perfection ii) confidence iii) punctuality & iv) aesthetic presentatio

**Psychomotor :** i) Use of correct pronunciation, tone, accent & intonation

ii) writing formal letters, drafts, reports, draft e-mails and prepare technical documents etc.

iii) Use of correct nonverbal code in formal & informal situations

iv)Speaking in formal & informal situations

**COURSE OUTCOMES :**

CCG203-1 Understand the concept of Communication and identify Communication barriers.

CCG203-2 Deliver Speeches to express thoughts, ideas and emotions.

CCG203-3 Write letters, reports, and E-mail in correct language.

CCG203-4 Make effective use of body language & graphical communication.

CCG203-5 Prepare and present simple media aided presentation.

CCG203-6 Prepare and face interview.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels** :1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos  | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering Practices for society, sustainability and Environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1 | PSO2 |
|---|---|--------------------------|---|--|---|----------------------------|----------------------------|------|------|
| <b>Competency :</b> Apply principles of communication to communicate in formal and informal scenario. | 3   | 2                        | 3   | -  | 2   | 2                          | 2                          |      |      |
| CCG203-1 Understand the concept of Communication and identify Communication barriers.                 | 2   | 2                        | 2   | -  | -   | 1                          | -                          |      |      |
| <b>CCG203-2</b> Deliver Speeches to express thoughts, ideas and emotions.                             | 3   | 2                        | 3   | -  | 2   | -                          | 2                          |      |      |
| <b>CCG203- 3</b> Write letters, reports, and E-mail in correct language.                              | 2   | 2                        | 3   | -  | 2   | 2                          | 1                          |      |      |
| <b>CCG203-4</b> Make effective use of body language & graphical communication                         | 2   | 2                        | 2   | -  | 2   | -                          | 2                          |      |      |
| <b>CCG203-5</b> Prepare and present simple media aided presentation                                   | 2   | 2                        | 2   | -  | -   | -                          | -                          |      |      |
| <b>CCG203-6</b> Prepare and face interview  | 2   | 2                        | 3   | -  | 2   | -                          | -                          |      |      |

**CONTENT:**

**C. ASSIGNMENTS:**

**Practical Exercises and related skills to be developed:**

The following practical exercises shall be conducted as practical assignments as given in the *Workbook on Communication Skills* developed by the Institute in practical sessions of batches of about 22 students:

| <b>Sr No.</b> | <b>Title of Practical Exercise</b>               | <b>Skills / Competencies to be Developed</b> | <b>Course Outcome</b> |
|---------------|--|--|-----------------------|
| 1.            | Characteristics of Communication Process         | Analysis of communication process            | CCG203-1              |
| 2.            | My Communication Barriers                        | Self analysis                                | CCG203-1              |
| 3.            | Oral Communication : Prepared Speech             | Preparing and delivery                       | CC G203-2             |
| 4.            | Oral Communication : Extempore Speech            | Creative thinking and speaking               | CC G203-2             |
| 5.            | Oral Communication : Conversation                | Listening, thinking and speaking             | CC G203-2             |
| 6.            | Oral Communication : Group Discussion            | Listening, thinking and convincing           | CC G203-2             |
| 7.            | Oral Communication : Group Debate                | Listening, thinking and convincing           | CC G203-2             |
| 8.            | Written Communication : Writing formal Letters   | Drafting                                     | CCG203-3              |
| 9.            | Written Communication : Writing Reports          | Drafting with comprehension                  | CCG203-3              |
| 10.           | Written Communication : Drafting of E-mail       | Drafting                                     | CCG203-3              |
| 11.           | Written Communication : Technical Writing        | Drafting                                     | CCG203-3              |
| 12.           | Non-verbal Communication : Graphic Communication | Graphic skills                               | CCG203-4              |
| 13.           | Non-verbal Communication : Body Language         | Body language                                | CCG203-4              |
| 14.           | Using Presentation Aids                          | Preparing Presentation Aids                  | CCG203-5              |
| 15.           | Interview Techniques                             | Facing an Interview                          | CCG203-6              |

**D. THEORY :**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|----------|--|------------------|---------------------------|
|          | <b>COURSE OUTCOME CCG203-1</b> Understand the concept of Communication and identify Communication barriers.  |                  |                           |
| <b>1</b> | <b>Introduction to Communication</b><br>1.1 Definition and Importance of Communication<br>1.2 Model of communication<br>1.3 Principles of effective communication<br>1.4 Types of communication : Formal, Informal, Oral, Written, Verbal, Non Verbal, Horizontal, Upward and Downward.<br>1.5 Barriers in communication : Physical, Mechanical, Psychological and Language.   | <b>10</b>        | <b>12</b>                 |
|          | <b>COURSE OUTCOME CCG203-2</b> Deliver Speeches to express thoughts, ideas and emotions.   |                  |                           |
| <b>2</b> | <b>Oral Communication</b><br>2.1 Characteristics of Oral Communication.<br>2.2 Tone, pronunciation and accents.<br>2.3 Spoken English: Conversation, Prepared and Extempore speech, Group Discussion and Debate.   | <b>08</b>        | <b>04</b>                 |
|          | <b>COURSE OUTCOME CCG203-3</b> Write letters, reports, and E-mail in correct language.   |                  |                           |
| <b>3</b> | <b>Written Communication</b><br>3.1 Characteristics of written communication.<br>3.2 Writing Reports : Accident, Progress & Fall in Production<br>3.3 Letter Writing : Application with Resume, Enquiry Letter, Complaint Letter and Order Letter.<br>3.4 E-mail Drafting<br>3.5 Technical Writing:  | <b>12</b>        | <b>10</b>                 |
|          | <b>COURSE OUTCOME CCG203-4</b> Make effective use of body language & graphical communication.  |                  |                           |
| <b>4</b> | <b>Non-verbal communication</b><br>4.1 Importance of Non-Verbal Communication.<br>4.2 Non Verbal Codes : Proxemics, Chronemics & Artefacts<br>4.3 Aspects of Body Language : Facial Expressions, Eye Contact, Vocalics, Gestures, Posture, Dress and Appearance & Haptics.<br>4.4 Graphical Communication : i) Advantages and Disadvantages of Graphical Communication.<br>ii) Tabulation of Data and its depiction in the form of Bar Graphs and Pie Charts | <b>06</b>        | <b>06</b>                 |

|   |  |           |           |
|---|--|-----------|-----------|
|   | <b>COURSE OUTCOME CCG203-5 Prepare and present simple media aided presentation.</b>  |           |           |
| <b>5</b>  | <b>Media Aided Presentation</b><br>5.1 Media aids for presentation: strengths and precautions<br>5.2 Planning, preparing and making a presentation<br>5.3 Use of presentation media. | <b>06</b> | <b>04</b> |
|   | <b>COURSE OUTCOME CCG203-6 Prepare and face Interview</b>  |           |           |
| <b>6</b>  | <b>Interview Techniques</b><br>6.1 Types of Interview<br>6.2 Advantages of Mock Interview.<br>6.3 Facing an Interview  | <b>06</b> | <b>04</b> |
|   | <b>Total</b>   | <b>48</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                 | Distribution of marks (Cognitive level-wise) |            |             | Course outcome | Total Marks |
|-----------|-------------------------------|--|------------|-------------|----------------|-------------|
|           |                               | Remember                                     | Understand | Application |                |             |
| 1         | Introduction to Communication | 02   | 06         | 04          | CCG203-1       | 12          |
| 2         | Oral Communication            | 00   | 02         | 02          | CCG203-2       | 04          |
| 3         | Written Communication         | 02   | 02         | 06          | CCG203-3       | 10          |
| 4         | Non-verbal Communication      | 02   | 02         | 02          | CCG203-4       | 06          |
| 5         | Media aided Presentation      | 00   | 02         | 02          | CCG203-5       | 04          |
| 6         | Interview Techniques          | 00   | 02         | 02          | CCG203-6       | 04          |
|           | Total >>                      | 06   | 16         | 18          |                | 40          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**E. INDUSTRIAL EXPOSURE:**

(Included in *Workbook on Communication Skills*)

| SN | Mode of Exposure                         | Topic                 |
|----|--|-----------------------|
| 1. | Oral and Written Communication Exercises | Industrial situations |
| 2. | Interview Techniques Exercises           | Industrial situations |

**ASSESSMENT CRITERIA FOR PRACTICAL ASSIGNMENTS AND PRACTICAL EXAMINATION**

**H) Assessment Criteria for Practical Assignments :**

**i) Continuous Assessment of Practical Assignments:**

Every practical assignment shall be assessed for 25 marks as per criteria given in *Workbook on Communication Skills*.

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 06              |
|              | Application                | 06              |
| Psychomotor  | Presentation Skills        | 04              |
|              | Drafting skills            | 05              |
| Affective    | Discipline and punctuality | 02              |
|              | Decency                    | 02              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**ii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted as per criteria given in *Workbook on Communication Skills*

Final marks of practical assignments shall be awarded as per *Assessment Pro-forma II*.

**I) Assessment Criteria for Term-end Practical Examination:**

*Term-end Practical Examination* shall be conducted by internal examiner (course teacher) and external examiner (course teacher of different class from the Institute) as per the following criteria.

| Item >  | Oral | Written | Total | Marks Converted out of |
|---------|------|---------|-------|------------------------|
| Marks > | 25   | 25      | 50    | 25                     |

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**INSTRUCTIONAL STRATEGIES:****Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Self Learning Methods using Language Lab

**Teaching and Learning Resources:**

1. Chalk board
2. LCD Projector
3. Audio Visual Streaming
4. Item Bank

**REFERENCE MATERIAL :****a) Books / Journals / IS Codes**

| Sr. No. | Author                         | Title  | Publisher                    |
|---------|--------------------------------|--|------------------------------|
| 1.      | K. Sudhesh                     | Development of Generic Skills                    | Nandu Printers & Pub, M'bai  |
| 2.      | M Ashraf Rizvi                 | Effective Communication Skills                   | Tata McGraw-Hill             |
| 3.      | Burgoon Michael                | Human Communication                              | SAGE Publications Inc.       |
| 4.      | Sanjay Kumar & Pushp Lata      | Communication Skills                             | Oxford University Press      |
| 5.      | Barun Mitra                    | Personality Development & Soft Skills            | Oxford University Press      |
| 6.      | Geoffrey Leech and Jansvartvik | A communicative Grammar of English               | Pearson Education ESL        |
| 7.      | Elizabeth Hiemey               | 101 ways to better communication                 | Pustak Mahal                 |
| 8.      | Thomas Huckin and Leslie       | Technical Writing and Professional Communication | McGraw Hill College Division |

**b) Websites**

- i) [www.clrp.cornell.edu/workshops/pdf/communication\\_skills-web.pdf](http://www.clrp.cornell.edu/workshops/pdf/communication_skills-web.pdf)
- ii) [http://depssa.ignou.ac.in/wiki/images/c/ca/Communication\\_skills\\_in\\_English.pdf](http://depssa.ignou.ac.in/wiki/images/c/ca/Communication_skills_in_English.pdf) www
- iii) <http://www.cgg.gov.in/Handbook%20on%20Communication%20Skills.pdf>
- iv) <http://www.stf-media.com/31-0-Presentations.html>
- v) [www.speaking-tips.com](http://www.speaking-tips.com)
- vi) [www.notesdesk.com](http://www.notesdesk.com)
- vii) [www.studylecturenotes.com](http://www.studylecturenotes.com)
- viii) <http://learnenglish.britishcouncil.org/en/content>
- ix) [www.languagelabsystem.com](http://www.languagelabsystem.com)

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**COURSE ID:**

**Course Name** : **Essence of Indian Traditional Knowledge**  
**Course Code** : **CCG205**  
**Course Abbreviation** : **GITK**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : *<nil >*

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 02           | 00      |
| Practical        | 00           |         |

**Evaluation Scheme :**

| Mode of Evaluation | Progressive Assessment  |           | Term End |             |    | Total |
|--------------------|---|-----------|----------|-------------|----|-------|
|                    | Theory  | Practical | Theory   | Practical * | TW |       |
| Marks              | From the assessment of submission on given topics the teacher should evaluate the student and assign him grades as mentioned at ##. |           |          |             |    |       |

**RATIONALE:**

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.

The course is introduced to get knowledge in Indian Philosophical Foundations and to know Indian Languages and Literature and the fine arts in India & their Philosophy. It also aims to explore the Educational system, Science and Scientists of Ancient, Medieval and Modern India.

**COMPETENCY:**

**Ability to interpret, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.**

**Cognitive:** Summarize philosophy of Indian culture and Distinguish the Indian languages and literature among difference traditions..

**Psychomotor:** Acquire the information about the fine arts in India.

**Affective:** Attitude of Unity in diversity, Tolerance and Universal acceptance, cultural synthesis and values of life.



**COURSE OUTCOMES:**

**CCG205-1:** Summarize and classify philosophy of Indian culture of ancient, medieval and modern India.

**CCG205-2:** Distinguish the Indian languages and literature among different traditions.

**CCG205-3:** Differentiate between Dharma and Religion.

**CCG205-4 :** Acquire the information about the fine arts in India.

**CCG205-5:** Study the contribution of education systems of different eras in India.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels** :1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos   | Programme Outcomes POs and PSOs                 |                          |   |  |   |                            |                            |      |      |
|--|---|--------------------------|---|--|---|----------------------------|----------------------------|------|------|
|  | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering Practices for society, sustainability and Environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1 | PSO2 |
| <b>Competency :Ability to interpret, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.</b> | -   | -                        | -   | -  | 1   | -                          | -                          | -    | -    |
| <b>CCG205-1:</b> Summarize and classify philosophy of Indian culture of ancient, medieval and modern India.                              | -   | -                        | -   | -  | 1   | -                          | -                          | -    | -    |
| <b>CCG205-2:</b> Distinguish the Indian languages and literature among different traditions.   | -   | -                        | -   | -  | 1   | -                          | -                          | -    | -    |
| <b>CCG205-3:</b> Differentiate between Dharma and Religion.  | -   | -                        | -   | -  | 1   | -                          | -                          | -    | -    |
| <b>CCG205-4 :</b> Acquire the information about the fine arts in India.  | -   | -                        | -   | -  | 1   | -                          | -                          | -    | -    |
| <b>CCG205-5:</b> Study the contribution of education systems of different eras in India.   | -   | -                        | -   | -  | 1   | -                          | -                          | -    | -    |

**CONTENT:**

**A. Suggested Assignments:**

**Practical Assignments and related skills to be developed:**

The following practical exercises / assignments shall be conducted and the student should be assessed for attainment of the competency (any 08 assignments).

| <b>Sr No.</b> | <b>Title of Practical Exercise</b>   | <b>Skills / Competencies to be Developed</b>   | <b>Course Outcome</b> |
|---------------|--|--|-----------------------|
| 1.            | Write the definition of Health according to WHO and describe important components of it.   | 1) Interpret the definition of Health.<br>2) Understand different components of Health.  | CCG205-1              |
| 2.            | Give introduction of any one Religious book.   | 1) Search different religious books.<br>2) Select a religious book of our own choice and study it.   | CCG205-2              |
| 3.            | Collect information about “Anapansati”, the method of meditation. Conduct a session of Anapansati with your family members, submit photographs of the session, and discuss the after effects amongst the meditators. | 1) Collect information about meditation methods.<br>2) Meditate and interpret the mental state before and after the meditation sessions.       | CCG205-3              |
| 4.            | Write an essay on any one Indian traditional festival. Prepare a relevant festival dish and submit a photograph of the dish.   | 1) Gather the information about Indian traditional festivals.<br>2) Understand the science and psychology behind the festive culture of India. | CCG205-3              |
| 5.            | Collect pictures / photographs of any five objects received during the excavation of “Sindhu culture” era and write their descriptions.  | 1) Search the pictures / photographs of ancient age.<br>2) Read and interpret information about our heritage.                                  | CCG205-4              |
| 6.            | Prepare / construct any model (like pair of oxen, figurine of God or human face etc.) from soil, mud, clay or any other material   | 1) Construct a model using soil.<br>2) Enjoy the artistic experiences.   | CCG205-4              |
| 7.            | Collect and write information of any five herbal medicinal plants. Grow one of them and submit   | 1) Search herbal medicinal plants and interpret their applications.  | CCG205-4              |

|     |  |  |          |
|-----|--|--|----------|
|     | the photograph.  | 2) Grow different types of plants.   |          |
| 8.  | Collect information about “Nalanda University” and write a short-note about it with reference to its establishment, progress, contribution, causes of destruction etc. | 1) Collect information of Indian ancient universities.<br>2) Interpret their contribution in building India as a nation.                         | CCG205-5 |
| 9.  | Write a descriptive note on the role of Indian mathematician in the development of mathematics.  | 1) Collect information about ancient Indian scientists and mathematicians.<br>2) Prepare a write-up of great Indian scientists – mathematicians. | CCG205-5 |
| 10. | Prepare a role play (in a group of 5 / 6 students) based on “Daily life in Gurukul”.   | 1) Conduct a role play on any topic.<br>2) Understand value based education and its significance in daily life.                                  | CCG205-5 |
| 11. | Write a descriptive note on “Maritime Trade in Ancient India”.   | 1) Gather information about trade in ancient India.<br>2) Understand the position of India in world trade market and India’s contribution in it. | CCG205-4 |

**B. THEORY :**

**SECTION-I**

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) |
|-----------|--|------------------|
|           | <b>CCG205-1:</b> Understand philosophy of Indian culture of ancient, medieval and modern India.  |                  |
| <b>1.</b> | <p><b>Introduction to Indian Philosophy:</b></p> <p>1.1 Basics of Indian Philosophy<br/>1.2 culture &amp; civilization<br/>1.3 culture and heritage<br/>1.4 Importance of culture in human literature<br/>1.5 General characteristics of Indian culture – Unity in diversity, Tolerance and Universal acceptance, □ (The World is a family), Freedom of worship (□), <b>Cultural synthesis- not cultural conflicts, unbroken traditions,</b><br/>1.6 Indian culture<br/>Ancient India, Medieval India, Modern India.</p> | <b>4</b>         |

|    |   |          |
|----|---|----------|
|    | <b>CCG205-2:</b> Distinguish the Indian languages and literature among different traditions   |          |
| 2. | <p style="text-align: center;"><b>Indian Philosophy &amp; Literature:</b></p> 2.1 Tradition of metaphysical knowledge<br>2.2 Vedas & Upanishads<br>2.3 Schools of Vedanta, and other religion Philosophical Literature<br>2.4 Philosophical Ideas<br>2.5 The role of Sanskrit<br>2.6 Significance of scriptures to current society<br>Indian languages and literature of India.                           | <b>6</b> |
|    | <b>CCG205-3:</b> Differentiate between Dharma and Religion.   |          |
| 3. | <p><b>Dharma, Religion and Philosophy:</b></p> 3.1 Meaning of Dharma as duties of Human being,<br>( )<br>( )<br>3.2 Dharma and Religion<br>3.3 Religious Philosophy in ancient India<br>3.4 Religious Philosophy in Medieval India<br>Religious Reform Movements in Modern India (selected movements only)  | <b>6</b> |
|    | <b>CCG205-4 :</b> Acquire the information about the fine arts in India  |          |
| 4. | <p><b>Indian Fine Arts &amp; Its Philosophy (Art, Science, Technology &amp; Engineering):</b></p> 4.1 Indian Painting<br>4.2 Indian handicrafts<br>4.3 Music, divisions of Indian classic music, modern Indian music<br>4.4 Dance and Drama<br>4.5 Indian Architecture - ancient, medieval and modern<br>Science and Technology in Indian, development of science in ancient, medieval and modern Indian. | <b>8</b> |
|    | <b>CCG205-5:</b> Study the contribution of education systems of different eras in India   |          |
| 5. | <p><b>Education System in India:</b></p> 5.1 The role of “Gurukulas” in Education System<br>5.2 Value based Education<br>5.3 Education in ancient, medieval and modern India, aims of education, subjects, languages<br>Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India.  | <b>8</b> |

## ASSESSMENT CRITERIA FOR PRACTICAL ASSIGNMENTS

### Continuous Assessment of Practical Assignments:

Every practical assignment shall be assessed for 25 marks as per following table.

| Domain       | Particulars                 | Marks out of 25 |
|--------------|-----------------------------|-----------------|
| Cognitive    | Understanding the objective | 05              |
| Psychomotor  | Manual work and Observation | 10              |
| Affective    | Discipline and punctuality  | 05              |
|              | Presentation of concept     | 05              |
| <b>TOTAL</b> |                             | <b>25</b>       |

## Grade to the students should be allotted as follows:-

| Range of continuous assessment marks      | Grade |
|---|-------|
| continuous assessment marks > 90          | A +   |
| 90 = / > continuous assessment marks > 85 | A     |
| 85 = / > continuous assessment marks > 80 | B +   |
| 80 = / > continuous assessment marks > 75 | B     |
| 75 = / > continuous assessment marks > 70 | C +   |
| 70 = / > continuous assessment marks > 60 | C     |

### INSTRUCTIONAL STRATEGIES:

#### Instructional Methods:

- Lectures cum Discussions
- Collaborative mini projects.
- Regular Home Assignments.

#### Teaching and Learning Resources:

- Chalk board
- Video clips
- PPT
- Charts

### REFERENCE MATERIAL :

#### a) Books / Journals / IS Codes

| Sr. No. | Author           | Title                    | Publisher                                       |
|---------|------------------|--------------------------|---|
| 1.      | □                | □                        | □ , □   |
| 2.      | S. Radhakrishnan | Indian Philosophy Vol. 1 | OUP India<br>ISBN: 9780195698411, 9780195698411 |

|    |                   |  |   |
|----|-------------------|--|---|
|    |                   |  | Edition: 2009   |
| 3. | Suresh Soni       | India's Glorious Scientific Tradition              | Prabhat Prakashan<br>ISBN: 9788184300284, 9788184300284 |
| 4. | □                 | □  |   |
| 5. | Krishna Chaitanya | Arts of India                                      | Abhinav Publications, 1987                              |
| 6. | NCERT             | "Position paper on Arts, Music, Dance and Theatre" | ISBN 81-7450-494-X, 2006                                |
| 7. | Satya Prakash     | "Founders of Sciences in Ancient India"            | Vijay Kumar Publisher, 1989                             |
| 8. | Altekar. A. S.    | Education in ancient India.                        | Banaras: Nanda Kishore & Bros.1948.                     |

**b) Websites**

- I. [https://nios.ac.in/online-course-material/secondary-courses/indian-culture-and-heritage-\(223\)-syllabus.aspx](https://nios.ac.in/online-course-material/secondary-courses/indian-culture-and-heritage-(223)-syllabus.aspx)
- II. <http://ncert.nic.in/textbook/pdf/heih111.pdf>

\* \* \*

**COURSE ID:**

**Course Name** : Indian Constitution  
**Course Code** : CCG206  
**Course Abbreviation** : GINC

**TEACHING SCHEME:**

**Pre-requisite Course(s)** : <nil >

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 02           | NIL     |
| Practical        | NIL          |         |

**Evaluation Scheme:**

| Mode of Evaluation | Progressive Assessment  |           | Term End |             |    | Total |
|--------------------|---|-----------|----------|-------------|----|-------|
|                    | Theory  | Practical | Theory   | Practical * | TW |       |
| Marks              | From the assessment of submission on given topics the teacher should evaluate the student and assign him grades as mentioned at ##. |           |          |             |    |       |

**RATIONALE:**

The course is designed to have basic knowledge of our Constitution, Its formation and process of forming the constitution and its importance. Also it is expected that the student should at least know the political system of nation, state, district and village also.

The judiciary system is also important part in the life of person and it is expected that the diploma student must at least know the system and its provisions in brief.

**COMPETENCY :**

**Ability to understand, connect up and explain basics of Indian constitution, Indian Politics and Indian judiciary in brief.**

**Cognitive :** Understand philosophy of Indian Constitution and Politics.

**Psychomotor:** Acquire the information about Politics, Judiciary and constitutional provisions.

**Affective:** Know the provisions of constitutions and legal process of changing the provisions in constitutions, political impacts on human life and provisions in judiciary and there importance.

**COURSE OUTCOMES :**

**CCG206-1:** Understand philosophy of Indian constitution.

**CCG206-2:** Know the formation process of state and central Government.

**CCG206-3:** Concept of Union Territory and provisions.

**CCG206-4 :** Indian Politics .

**CCG206-5:** Study the Judiciary system in India.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels** :1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos  | Programme Outcomes POs and PSOs                 |                          |   |  |   |                            |                            |      |      |
|---|---|--------------------------|---|--|---|----------------------------|----------------------------|------|------|
|   | PO 1<br>Basic and Discipline specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solutions | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>Engineering Practices for society, sustainability and Environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1 | PSO2 |
| <b>Competency</b> : Understand philosophy of Indian constitution            | 0   | 1                        | 1   | 0  | 1   | 1                          | 2                          |      |      |
| <b>CCG206-1:</b> Understand philosophy of Indian constitution               | 1   | 0                        | 1   | 0  | 1   | 1                          | 2                          |      |      |
| <b>CCG206-2:</b> Know the formation process of state and central Government | 0   | 1                        | 1   | 1  | 2   | 1                          | 2                          |      |      |
| <b>CCG206-3:</b> Concept of Union Territory and provisions                  | 0   | 1                        | 1   | 1  | 1   | 1                          | 2                          |      |      |
| <b>CCG206-4 :</b> Indian Politics .   | 0   | 0                        | 1   | 1  | 2   | 2                          | 2                          |      |      |
| <b>CCG206-5:</b> Study the Judiciary system in India                        | 0   | 1                        | 1   | 1  | 2   | 2                          | 3                          |      |      |

**CONTENT:**

**C. Suggested Assignments:** It is expected that the student should prepare write up of at least 5 topics as a home work and submit report to the teacher before the grant of term.



**D. THEORY :**

| <b>SECTION-I</b>   |   |                         |
|--|---|-------------------------|
| <b>Sr. No.</b>   | <b>Topics / Sub-topics</b>  | <b>Lectures (Hours)</b> |
| <b>CCG206-1:</b> Understand philosophy of Indian constitution.               |   |                         |
| <b>1</b>   | <b>Unit 1.</b> The Constitution:-<br>1.1 Introduction.<br>1.2 The History of making of the Indian Constitution.<br>1.3 Basic structure and its interpretation.<br>1.4 Fundamental Rights and Duties and their interpretation              | <b>4</b>                |
| <b>CCG206-2:</b> Know the formation process of state and central Government. |   |                         |
| <b>2</b>   | <b>Unit 2 .</b> Union Government<br>2.1 Structure of the Indian Union.<br>2.2 President –Role and power.<br>2.3 Prime minister and council of ministers.<br>2.4 Lok sabha and Rajya Sabha.<br>2.5 Union Teritories and their limitations. | <b>6</b>                |
| <b>CCG206-2:</b> Know the formation process of state and central Government. |   |                         |
| <b>3</b>   | <b>Unit 3.</b> State Government.<br>3.1 Governer –Role and power.<br>3.2 Chief Minster and council of ministers.<br>3.3 State secretariat.<br>3.4 Administrative Regions of Maharashtra.  | <b>6</b>                |
| <b>SECTION -II</b>   |   |                         |
| <b>CCG206-2:</b> Know the formation process of state and central Government. |   |                         |
| <b>4</b>   | <b>Unit.4</b> Local Administration:-<br>4.1 District Administration.<br>4.2 Municipal Corporation.<br>4.3 Zilla Panchayat<br>4.4 Taluka (Tahasil) Administration .  | <b>4</b>                |
| <b>CCG206-4 : Indian Politics .</b>  |   |                         |

|   |   |          |
|---|---|----------|
| <b>5</b>  | <b>Unit 5.</b> Election Commission.<br>5.1 Role and functioning.<br>5.2 Chief Election Commissioner –Appointment.<br>5.3 State Election Commission.<br>5.4 Elections and duties of government /Non government servants – introduction | <b>6</b> |
| <b>CCG206-5: Study the Judiciary system in India.</b> |   |          |
| <b>6</b>  | <b>Unit 6.</b> Judiciary Provisions :-<br>1.1 Introduction<br>1.2 Different courts.<br>1.3 Government legal advisor-provisions.<br>1.4 Limitations of courts and co-ordination with Home department.                                  | <b>6</b> |

**E. ASSESSMENT CRITERIA FOR PRACTICAL ASSIGNMENTS :- It is expected that the student should prepare write up of at least 5 topics as a home work and submit report to the teacher before the grant of term.**

1. Indian constitution formation .
2. Indian constitution important provisions.
3. Formation of Indian government process.
4. Power of president and prime minister/important facilities to them.
5. District administration along with administration at municipal corporation, tahasil and jilha panchayat.
6. Election commission and their responsibilities.
7. Judiciary system in india-District courts and their limitations.

**Continuous Assessment of Practical Assignments: No practical's but student should write at least 5 assignments on above topics..**

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Discussions.

**Teaching and Learning Resources:**

1. Chalk board
2. Video clips
3. PPT
4. Suggested websites.

**REFERENCE MATERIAL :**

**Suggested Learning Resources**

| Sr.no | Title of Book                              | Author         | Publication                       |
|-------|--|----------------|-----------------------------------|
| 1     | Ethics and Politics of Indian constitution | Rajiv Bhargava | Oxford University –New Delhi-2008 |
| 2     | The Constitution Of India                  | B.L.Fadia      | Sahitya Bhawan- 2017 edition      |
| 3     | Introduction to constitution of Indian     | D.D.Basu       | Lexis Nexis- 2018 Edition         |
| 4     | Maharashtra Shasan diary                   |                |                                   |

**Suggested softwares /Learning websites:-**

1. <https://www.constitution.org/cons/india/const.html>
2. <https://www.legislative.gov.in/constitution-of-india>
3. <http://www.sci.gov.in/constitution>
4. <http://www.toppr.com/guide/civics/the-indian-constitution/the-constitution-of-india>

**## Grade to the students should be allotted as follows:-**

1. If the student scores marks more than 90 percent – Grade A +
2. If the student scores marks more than 85 percent – Grade A
3. If the student scores marks more than 80 percent – Grade B +
4. If the student scores marks more than 75 percent – Grade B
5. If the student scores marks more than 70 percent – Grade C +
6. If the student scores marks more than 60 percent – Grade C

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# **LEVEL III – BASIC TECHNOLOGY**

## **COURSES**

**COURSE ID** : CE  
**Course Name** : APPLIED MATHEMATICS  
**Course Code** : CEG301  
**Course Abbreviation** : GAMT

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : CCG105, CCG106

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 04      |
| Practical        | 01           |         |

**Evaluation Scheme :**

| Component Details and Duration | Progressive Assessment                |                              | Term End                        |           | Total |
|--------------------------------|---------------------------------------|------------------------------|---------------------------------|-----------|-------|
|                                | Theory                                | Tutorials                    | Theory                          | Practical |       |
|                                | Average of two tests of 20 marks each | As mentioned in the syllabus | Term End Theory Exam (03 hours) | NIL       |       |
| Marks                          | 20                                    | --                           | 80                              |           | 100   |

**RATIONALE:**

Mathematics is an important pre-requisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of Mathematics is an effective tool to pursue and to master the applications in the engineering and technological fields. Applied mathematics is designed for its applications in engineering and technology. It includes integration, differential equation,. The connection between applied mathematics and its applications in real life can be understood and appreciated. Integral calculus helps in finding the area, mean value R. M. S value etc . Differential equation is used in finding curve, rectilinear motion. Statistics and probability will help a student to analyze data of large volume in their higher studies. The fundamentals of these topics are directly useful in understanding engineering applications in various fields.

**COMPETENCY:**

The course should be taught and implemented with the aim to develop the course outcomes (CO's) for the student to acquire the competency needed to apply the mathematical techniques for engineering subjects.

1. Cognitive: understanding and applying principles of mathematics to engineering problems

2. Psychomotor: To prepare charts displaying the area of irregular shapes using the concept of integration, prepare charts to displaying grouped and ungrouped data

3. Attitude: discipline, consistency, hard work, to concentrate, accuracy, punctuality, aesthetics

**COURSE OUTCOMES(CO's)**

**CEG301.1** Apply the concept of integration to find the areas

**CEG301.2** Solve Differential equation of first order and first degree by various methods

**CEG301.3** Solve examples on Laplace Transform

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

| Competency and COs  | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|---|--|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> to apply the mathematical techniques for engineering subjects                  | 3  | 2                     | 2                                    | 2   | --  | --                      | 3                       | 2                    | 1                                 | --                            |
| <b>CEG301.1</b><br>Apply the concept of integration to find the areas                             | 3  | 2                     | 3                                    | 3   | 2   | 2                       | 3                       | 2                    | 1                                 | --                            |
| <b>CEG301.2</b><br>Solve Differential equation of first order and first degree by various methods | 3  | 2                     | 2                                    | 2   | 1   | 2                       | 3                       | 1                    | 1                                 | --                            |
| <b>CEG301.3</b><br>Solve examples on Laplace Transform  | 3  | 1                     | 1                                    | 2   | 1   | 2                       | 3                       | 1                    | 1                                 | --                            |

**CONTENT : THEORY**

**Section I**

| Sr. No.  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|--|---|------------------|---------------------------|
| <b>CEG301.1</b> Apply the concept of integration to find the areas   |   |                  |                           |
| <b>1</b>   | <b>Indefinite Integrals</b><br>1.1 Definition, Standard formulae<br>1.2 Rules of Integration(without proof),<br>Examples<br>1.3 Integration by substitution<br>1.4 Integration by parts<br>1.5 Integration by partial fractions | <b>12</b>        | <b>20</b>                 |
| <b>CEG301.1</b> Apply the concept of integration to find the areas   |   |                  |                           |
| <b>2</b>   | Definite Integrals<br>2.1 Definition, Examples<br>2.2 Properties of Definite Integration ( without proof),<br>Examples based on properties  | <b>06</b>        | <b>10</b>                 |
| <b>CEG301.1</b> Apply the concept of integration to find the areas   |   |                  |                           |
| <b>3</b>   | Application of Integration<br>3.1 Area under the curve and<br>3.2 Area between two curves   | <b>06</b>        | <b>10</b>                 |
| <b>Total</b>   |   | <b>24</b>        | <b>40</b>                 |
| <p><b>1.</b> Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> <p><b>2.</b> In each topic, corresponding applications will be explained.</p> |   |                  |                           |

**Section II**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>CEG301.2</b> Solve Differential equation of first order and first degree by various methods   |  |                  |                           |
| <b>4</b>   | <b>Differential equations</b><br>4.1 Definition of differential equation<br>4.2 Order & degree of Differential equations<br>4.3 Solutions of Differential equations of first order & first degree of following types<br>4.3.1 Variables separable<br>4.3.2 Homogenous Equation<br>4.3.3 Exact equations<br>4.3.4 Linear Equations  | <b>12</b>        | <b>20</b>                 |
| <b>CEG301.3</b> Solve examples on Laplace Transform  |  |                  |                           |
| <b>5</b>   | <b>LAPLACE TRANSFORM</b><br>5.1 Definition ,Linearity property<br>5.2 Laplace Transforms of Standard functions(without proof) and examples<br>5.3 First shifting property and examples<br>5.4 Examples on Multiplication by $t^n$<br>5.5 Inverse Laplace Transform, Definition<br>5.6 Standard formulae(without proof) and examples<br>5.7 Inverse L.T.by using First shifting property<br>5.8 Inverse L.T. by using Partial fraction method | <b>12</b>        | <b>20</b>                 |
| <p>1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> <p>2.In each topic corresponding applications will be explained</p> |  |                  |                           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic              | Distribution of marks (level wise) |               |             | Course Outcome | Total Mar |
|-----------|----------------------------|------------------------------------|---------------|-------------|----------------|-----------|
|           |                            | Remember                           | Comprehension | Application |                |           |
| 1         | Indefinite Integrals       | 4                                  | 6             | 10          | CEG301.1       | 20        |
| 2         | Definite Integrals         | 2                                  | 2             | 10          | CEG301.1       | 14        |
| 3         | Application of Integration | --                                 | --            | 06          | CEG301.1       | 06        |
| 4         | Differential               | 4                                  | 4             | 12          | CEG301.2       | 20        |
| 5         | Laplace Transformation     | 6                                  | 6             | 8           | CEG301.3       | 20        |



Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

### A) TUTORIALS

Note: Tutorials are to be used to get enough practice [One batch for 20 Students ]

| Sr No. | Topic                      | Tutorial Content (10 problems in each tutorial)  |
|--------|----------------------------|--|
| 1      | Indefinite Integrals       | To evaluate Integration using standard formulae, To evaluate Integration using Substitution Method |
| 2      | Indefinite Integrals       | To evaluate Integration of Various forms.  |
| 3      | Indefinite Integrals       | To evaluate Integration using by Parts rule and Partial fraction method                            |
| 4      | Definite Integrals         | To evaluate Define Integration for various forms and using properties.                             |
| 5      | Application of Integration | Apply Integration concepts to find Area  |
| 6      | Differential equations     | To determine Order and Degree of D.E..<br>Examples on V.S. form , Homogeneous form                 |
| 7      | Differential equations     | Examples on Linear of D.E and Exact D.E.   |
| 8      | LaplaceTransformation      | Examples on L.T.using standard formulae and first shifting property                                |
| 9      | LaplaceTransformation      | Examples on L.T using first shifting property and multiplication by                                |
| 10     | LaplaceTransformation      | Examples on inverse L.T.   |

### Instructional Methods :

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .

### Teaching and Learning resources:

1. Chalk board
2. Item Bank
3. Charts
4. Computers

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**REFERENCE MATERIAL :**

**a) Books:**

| Sr. No. | Author          | Title                          | Publisher                             |
|---------|-----------------|--------------------------------|---------------------------------------|
| 1       | G.V. Kumbhojkar | Engineering Mathematics III    | Phadake Prakashan, Kolhapur           |
| 2       | Patel, Rawal,   | Applied Mathematics            | Nirali Prakashan, Pune                |
| 3       | Sameer Shah     | Applied Mathematics            | Tech-Max Publication, Pune            |
| 4       | P.N.Wartikar    | Applied mathematics            | Pune vidyarthi Griha Prakashan , pune |
| 5       | H.K.Dass        | Higher engineering mathematics | S .Chand publication                  |
| 6       | B.S.Grewal      | Higher engineering Mathematics | Khanna publication, New Delhi         |

**b) Website**

- i) [www.khanacademy.org](http://www.khanacademy.org)
- ii) [www.easycalculation.com](http://www.easycalculation.com)
- iii) [www.math-magic.com](http://www.math-magic.com)

**COURSE ID :**

**Course Name : BUILDING CONSTRUCTION**  
**Course Code : CEG302**  
**Course Abbreviation : GBCO**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 04           | 06      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                     |   | Term End Examination            |                      | Total |
|-----------------------|--|---|---------------------------------|----------------------|-------|
|                       | Theory   | Oral                                    | Theory Examination              | Oral                 |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | One Progressive Skill Tests of 25 marks | Term End Theory Exam (04 hours) | As per Proforma- III |       |
| Marks                 | 20   | --                                      | 80                              | 75** E               | 175   |

\* Assessment as per Pro-forma III

**RATIONALE:**

Civil Engineering is a discipline that deals with the use of various resources on the earth for the benefit of mankind. As a civil engineer is mainly concerned with the construction of building. It is essential for him to acquire good knowledge of properties of construction materials and construction of various components of a building.

This subject is a very basic to a civil engineer and therefore it is essential to treat this subject in an integrated manner.

**COMPETENCY**

Apply principles of construction engineering to solve construction problems as follows.

**Cognitive:** Understanding and applying principles of construction engineering to engineering problems.

**Psychomotor:** i) Transferring lay out plan ii) Handling plumb-bob, Tube level and transferring levels.

**Affective:** Attitude of

i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation  
 hygiene vii) civic sense

**COURSE OUTCOMES:**

**CEG302-1** Identify the components of building structure and materials required for construction.

**CEG302-2** Propose suitable type of foundation & type of masonry for building structure.

**CEG302-3** Select the suitable type & Sizes of doors, windows for different types of building.

**CEG302-4** Select the suitable type relevant means of vertical communications for different types of building.

**CEG302-5** Select the relevant material for finishing work.

**CEG302-6** Decide type of formwork and special treatment to the buildings.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ **Note : Correlation levels** :1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Programme Outcomes POs and PSOs   |   |                          |   |  |   |                            |                            |                         |                                      |                                  |
|---|---|--------------------------|---|--|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
| Competency and COs  | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of environmental engineering (water supply and sanitary engineering) to solve engineering problems. | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG302-1</b> Identify the components of building structure and materials required for construction.                                  | 3   | 3                        | 3                                       | 2  | 1   | 2                          | 2                          | 3                       | 1                                    | 2                                |
| <b>CEG302-2</b> Propose suitable type of foundation & type of masonry for building structure.   | 3   | 3                        | 2                                       | 2  | 2   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG302-3</b> Select the suitable type & Sizes of doors, windows for different types of building.                                     | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG302-4</b> Select the suitable type relevant means of vertical communication for different types of building.                      | 3   | 3                        | 3                                       | 2  | 2   | 1                          | 1                          | 3                       | 3                                    | 2                                |
| <b>CEG302-5</b> Select the relevant material for finishing work.  | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG302-6</b> Decide type of formwork and special treatment to the buildings.   | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                       | 3                                    | 1                                |

**CONTENT :THEORY**

**A) PRACTICALS/EXERCISE**

**Practical Exercises and related skills to be developed:**

The following practical exercises shall be conducted as practical sessions of batches of about 20 students :

Continuous assessment work is dividing three parts as below –

- A) Field visits.
- B) Market Survey
- C) Plates
- D) Practicals
- E) Microprojects

| <b>Sr No.</b> | <b>Title of Practical Exercise</b>   | <b>Skills / Competencies to be developed</b>   | <b>Course Outcome</b> |
|---------------|--|--|-----------------------|
| <b>A</b>      | <p><b>Field visits –</b></p> <ul style="list-style-type: none"> <li>1) To study brick kiln / stone-quarry, stone crusher</li> <li>2) To study building components.</li> <li>3) To study building plumbing details</li> <li>4) To study water proofing of WC &amp; roof slab.</li> <li>5) To study plastering / pointing procedure.</li> <li>6) To study masonry construction work.</li> <li>7) To study RCC slab casting.</li> <li>8) To study RCC footing ,beam ,column , chajjah etc. construction</li> <li>9)To study pile foundations.</li> <li>10) To study different types of woods and sawing of wood.</li> </ul> | <ul style="list-style-type: none"> <li>1. Information collection and presentation in form of report</li> <li>2. Motivation through field exposure</li> </ul> | CEG302-1 to CEG302-8  |
| <b>B</b>      | <p><b>Market Survey</b></p> <p>Market survey for types, cost, sizes, specifications etc of following materials.</p> <ul style="list-style-type: none"> <li>1. Wall tiles, flooring tiles, natural stones like polished granite, marble, kadappa etc.</li> <li>2. Plumbing materials : GI,PVC, APVC, CPVC etc</li> <li>3. Aluminum / structural steel / gas lines etc</li> <li>4. Fixtures and fastening of doors and windows</li> <li>5. Plywood, sunmica, fore-mica etc.</li> </ul>   | <ul style="list-style-type: none"> <li>1. Self learning ability using</li> </ul>   | CEG302-1 to CEG302-8  |

|          |   |  |                             |
|----------|---|--|-----------------------------|
| <b>C</b> | <p><b>Plates (Any eight plates)</b></p> <ol style="list-style-type: none"> <li>1. Types of Foundation : Shallow and deep. ( 2 plates )</li> <li>2. Cross section of a load- bearing wall from foundation to parapet wall. Also sketch of through stone, coping and throating ( 1 plate )</li> <li>3. Types of doors &amp; Windows: Battened, ledged and braced, Solid core flush door, paneled door, Louvered window, Fully glazed with aluminum frame sliding window- ( 2 plates )</li> <li>4. Different types of stairs : Dog-legged stair (R.C.C.),Bifurcated stair, Circular stair.( 1 plate )</li> <li>5. Structural steel sections. ( 1 plate ) Details of Reinforced Concrete Column footing.( 1 plate )</li> <li>6. Ramp, escalator, lift ( 1 plate)</li> <li>7. Form work for beams and columns ( 1 plate )</li> </ol> | <ol style="list-style-type: none"> <li>1. Plotting and interpreting. graphs</li> <li>2.Presentation skills</li> </ol>  | <p>CEG302-1 to CEG302-8</p> |
| <b>D</b> | <p><b>Practicals</b></p> <ol style="list-style-type: none"> <li>1. Practice to hold plumb-bob, tube level and transferring the levels eg. Lintel level for doors and windows.</li> <li>2. Setting out a simple residential building (Line out of a framed structure)</li> </ol>   | <ol style="list-style-type: none"> <li>1.Self learning ability using</li> </ol>  |                             |
| <b>E</b> | <p><b>Suggested Micro-projects:</b></p> <p><b>Any one project for group of three to five students.</b></p> <ol style="list-style-type: none"> <li>a. Collect the relevant information of recent technologies in building construction and prepare a report on it.</li> <li>b.. Identify the different types of cracks and remedial measures and submit report on case study.</li> <li>c. Collect the relevent information of different techniques of demolition of existing structure and submit a report on it.</li> </ol>   | <ol style="list-style-type: none"> <li>1. Information collection and presentation in the form of report.</li> <li>2. Motivation through field exposure.</li> <li>3. Developing self learning ability.</li> </ol> |                             |

|  |   |  |  |
|--|---|--|--|
|  | <p><b>d.</b> Prepare a summary report with reference to any one part of National building Code.</p> <p><b>e.</b> Search software for the course content and write the report stating the applications.</p> <p><b>f. Market Survey</b><br/>Prepare a Market survey for types, cost, sizes, specifications etc of following materials.</p> <ol style="list-style-type: none"> <li>1. Wall tiles, flooring tiles, natural stones like polished granite, marble, kadappa etc.</li> <li>2. Plumbing materials : GI,PVC, APVC, CPVC etc</li> <li>3. Aluminum / structural steel / gas lines etc</li> <li>4. Fixtures and fastening of doors and windows</li> <li>5. Plywood, sunmica, fore-mica etc.</li> </ol> |  |  |
|--|---|--|--|

**B) THEORY :**

**Section – I**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>Course Outcome- CEG302-1 Identify the components of building structure and materials required for construction.</b> |  |                  |                           |
| <b>1</b>   | <p><b>Building components and materials</b></p> <p>1.1 <b>Classification of Buildings</b></p> <p>1.2 <b>Types of structures</b> : load bearing structure, framed structure and composite structure</p> <p>1.3 <b>Building components and their functions:</b> a) sub structure: foundation and plinth b) super structure: wall, sill, lintel, chejja, arches, windows, doors, floors, roof, beam and columns, parapet, etc.</p> <p>1.4 <b>Masonry materials</b> : a) building stones : classification of rocks, requirements of good building stone b) bricks : conventional bricks, standard bricks, composition of clay bricks, testing of bricks, fly ash bricks and hollow blocks c) mortars : lime mortar, cement mortar, special mortars, function, properties and tests on mortar d) timber and timber based materials : uses of timber, characteristics of good timber, defects in timber, plywood, particle board, veneer, sun mica, fore mica and artificial timber e) miscellaneous materials : glass, plastic, fibers, aluminum, steel, GI, PVC, CPVC and artificial sand.</p> | <b>10</b>        | <b>10</b>                 |

| <b>Course Outcome- CEG302-2 Propose suitable type of foundation &amp; type of masonry for building structure.</b>   |  |           |           |
|---|--|-----------|-----------|
| 2   | <p><b>2A. Construction of sub-structure</b></p> <p><b>2A.1 Job-layout:</b> site clearance, preparation of layout plan, transferring layout plan for framed structure on ground, precautions while making layout on ground.</p> <p><b>2A.2 Earthwork :</b> excavation for foundation, timbering and strutting for foundation trench, tools and plants used for excavation</p> <p><b>2A.3 Foundations :</b> definition, purpose, requirements of good foundation, types of shallow foundations, types of deep foundations : functions and Sketches</p> <p>2A.4 Precautions to be taken while constructing foundation in black cotton soils</p> | <b>09</b> | <b>12</b> |
| 2   | <p><b>2B. Construction of super-structure</b></p> <p><b>2B.1 Stone masonry:</b> terms used in stone masonry, classification of stone masonry, tools used for stone masonry, requirements of good stone masonry.</p> <p><b>2B.2 Brick masonry :</b> terms used, requirements of good brick-work, bonds in bricks : English bond, Flemish bond, stretcher bond and header bonds, tools used for brick masonry<br/>Comparison between stone masonry and brick masonry<br/>Hollow concrete block masonry and composite masonry</p> <p><b>2B.3 Scaffolding:</b> purpose, component parts and types of scaffolding and their suitability.</p>      | <b>09</b> | <b>12</b> |
| <b>Course Outcome- CEG302-3 Select the suitable type &amp; Sizes of doors, windows for different types of building.</b>   |  |           |           |
| 3   | <p><b>Doors and windows</b></p> <p>4.1 Different sizes of doors for residential and public buildings.<br/>Types of doors – battened doors, paneled doors, flush doors, collapsible e doors, rolling, shutters, revolving doors, glazed Doors, components of each door and their suitability.</p> <p>4.2 Various types of windows : glazed, steel, aluminum-sliding window, louvered window, ventilators, cement grills and their suitability</p> <p>4.3 Fixtures and fastening for doors, windows and ventilators, Protective treatment for doors and windows.</p>   | <b>04</b> | <b>06</b> |
| <b>Total</b>  |  | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |



**Section II**

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>Course Outcome- CEG302-4 Select the suitable type relevant means of vertical communications for different types of building.</b> |  |                  |                           |
| 4   | <p><b>Vertical Communication</b></p> <p>5.1 Means of vertical communication: stairs, lift or elevator, escalator, ramp, sketches and suitability of each.</p> <p>5.2 Terms used in staircase, requirements of good staircase, thumb rule for deciding rise, tread combination, types of stairs: straight, dog-legged stair, bifurcated stair, circular stair, suitability of each stairs.</p> <p>5.3 Details of a RCC simply supported stair and fabricated stair</p>  | 04               | 08                        |
| <b>Course Outcome – CEG302-5 Select the relevant material for finishing work.</b>   |  |                  |                           |
| 5   | <p><b>Building Finishes</b></p> <p><b>6.1 Floors And Roofs</b><br/>Types of floor finishes: Shahabad, kota, marble, granite, kadappa, ceramic, vitrified, marbonite and latest materials available in the market. Pavement blocks, concrete floors, tremix floors, skirting and dado.<br/>Factors affecting the selection of flooring / materials<br/>Mezzanine floors, location and use<br/>Necessity of roofs: Types: pitched &amp; flat ,component parts of pitched roof, requirements of good roof<br/>Roof coverings: Mangalore tiles.GI, AC, Fibre &amp; HDP sheets</p> <p><b>6.2 Finishing works</b><br/><b>Plastering</b> : necessity, pre-construction preparation, internal plaster : Neeru finish and POP, external plaster : sponge finish, rough finish, pebble finish and stucco plaster<br/><b>Pointing</b> : necessity and procedure of pointing<br/><b>Painting</b> : necessity and surface preparation for white wash, colour wash, oil bound distemper, plastic emulsion, oil paint, cement paint, selection of suitable material</p> | 16               | 16                        |
| <b>Course Outcome – CEG302-6 Decide type of formwork and special treatment to the buildings.</b>                                    |  |                  |                           |
| 6   | <p><b>Form work, centering and allied process</b></p> <p>7.1 Necessity, materials used in form work and centering. Form work<br/>sketches for column, beam, chejja and stair, stripping time of Formwork and centering for beams, columns and slabs etc.<br/>requirements of good form-work</p>  | 12               | 16                        |

|   |  |           |           |
|---|--|-----------|-----------|
|   | 7.2 <b>Water proofing</b> – necessity and importance, methods of waterproofing for RCC slab and WC<br>7.3 <b>Termite proofing</b> – necessity<br>7.4 <b>Re-barring technique</b> – necessity<br>7.5 Causes of cracks in building, repair of cracks, guniting and Grouting. |           |           |
| <b>Total</b>  |  | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**C) Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                           | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---|--|------------|-------------|----------------|-------------|
|           |   | Remember                                     | Understand | Application |                |             |
| 1         | Building components and materials       | 02   | 02         | 06          | CEG302-1       | 10          |
| 2         | 2A Construction of sub-structure        | 02   | 04         | 06          | CEG302-2       | 12          |
|           | 2B Construction of super-structure      | 02   | 04         | 06          | CEG302-3       | 12          |
| 3         | Doors and windows                       | 02   | 02         | 02          | CEG302-4       | 06          |
| 4         | Vertical Communication                  | 02   | 02         | 04          | CEG302-4       | 08          |
| 5         | Building Finishes                       | 04   | 04         | 08          | CEG302-5       | 16          |
| 6         | Form work, centering and allied process | 02   | 04         | 10          | CEG302-6       | 16          |
|           | <b>TOTAL</b>                            | <b>16</b>                                    | <b>22</b>  | <b>42</b>   |                | <b>80</b>   |

**D) INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                     | Topic                            |
|----|--------------------------------------|----------------------------------|
| 1. | Field Visits and market survey.      | Every chapter of theory syllabus |
| 2. | Collecting data for assignment work. | Term-work assignment             |

## E) CONTINUOUS ASSESSMENT WORK CRITERIA FOR EXAMINATION

### Assessment Criteria for Term work :

#### i) Continuous Assessment :

Every practical assignment shall be assessed for 25 marks as per following criteria:

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

#### ii) Progressive Skill Test :

One mid-term *Progressive Skill Test* of 25 marks shall be conducted marks awarded in oral mark sheet as per *Assessment Pro-forma III*.

## F) INSTRUCTIONAL STRATEGIES :

### Instructional Methods :

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

### Teaching and Learning resources:

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**G) REFERENCE MATERIAL :**

**Books / Journals / IS Codes / Websites**

**a)Reference Books:**

| Sr. No. | Author         | Title                 | Publisher         |
|---------|----------------|-----------------------|-------------------|
| 1.      | Sushilkumar    | Building Construction | PhadkePrakashan   |
| 2.      | S. C. Rangwala | Building Construction | Khanna Publishers |
| 3.      | BindraArrora   | Building Construction | C.Jamanadas& Co   |
| 4.      | B.C.Punmia     | Building Construction | SatyaPrakashan    |
| 5.      | S.K. Sharma    | Building Construction | S.Chand& co.      |

**b) Recommended Further Readings:**

| Sr. No. | Author                             | Title   | Publisher                            |
|---------|------------------------------------|---|--------------------------------------|
| 1       | Frederick S Merritt & J T Ricketts | Building design & construction handbook             | McGRAW-HILL:NewDelhi                 |
| 2       | R Chudley& R Greeno                | Building construction handbook(7 <sup>th</sup> EDN) | ELSEVIER                             |
| 3.      | BIS                                | i) National Building Code<br>ii) BIS962-1989        | Buieau of Indian Standard, NEW Delhi |

**c)Codes of Practice: IS, BIS and international codes:**

1. National Building code of India 2016(NBC 2016) SP7:2016
2. IS 1893:1984 Criteria for Earthquake Resistance Design of Structures
3. IS 1893(Part 1):2002 General Provisions & Buildings
4. IS 4326:1993 Earthquake Resistance Design & Constructions of Buildings Code of practice
5. IS 13828:1993 Earthquake Resistance of Low Strength Masonry Buildings

**d) Websites:**

1. <http://en.m.wikipedia.org/wiki/Bureau>
2. [www.standardsbis.in](http://www.standardsbis.in)>scoperef>SRSP62

\* \* \*

**COURSE ID:**

**Course Name : BUILDING DRAWING**  
**Course Code : CEG303**  
**Course Abbreviation : GBDR**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CCG107, CCG108**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 02           | 06      |
| Practical        | 04           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment  |  | Term End Examination |                                 | Total |
|-----------------------|---|--|----------------------|---------------------------------|-------|
|                       | Theory  | Practical                              | Theory               | Oral                            |       |
| Details of Evaluation | Average of Two tests of 20 marks each(1.5 hour duration each) | One Progressive Skill Test of 25 marks | One paper (4 hours)  | Based on TW as per proforma III |       |
| Marks                 | 20  | 25                                     | 80                   | 75 E                            | 175   |

\*(To be assessed by internal examiner) \*\* (To be assessed by internal and external examiner)

**RATIONALE:**

Drawing is core language of Engineers. An engineer must be well conversant with drawing. It is the language through which communication between Owner, Architect, Engineer and Contractor takes place. Through drawings, engineer can also communicate with skilled, semiskilled and unskilled labour. With the help of drawing Civil Engineer has to convert design parameters and process details into actual practice. Therefore he is required to understand and prepare the drawings. Civil engineer should be competent to convert his ideas into the drawing and he has to interpret the drawings, so that he can execute the work. Drawing help to execute and implement easily. Drawings are also essential for drafting specifications and tender documents. The knowledge of this subject is useful for building construction, estimating and costing, design of structures, surveying, project etc. The student has to use this subject to develop ability to read, understand and prepare drawings, to use it for different subjects during diploma course. He will be draw civil engineering Structures and its various parts using conventions and symbols as per BIS- 962-1989.

## COMPETENCY

Apply principles of Building Drawing to solve engineering problems as follows.

**Cognitive: Understanding** and applying principles of Building Drawing to engineering problems.

**Psychomotor:** I) Designing residential building ii) Applying building planning principles iii) Public building Planning

**Affective: Attitude** of i) accuracy ii) safety iii) aesthetic presentation iv) Hygiene v) civic sense

## COURSE OUTCOMES:

**CEG303-1** Draw different types of lines.

**CEG303-2** Apply building bye laws for planning of building.

**CEG303-3** Apply principles of planning for planning and design of building.

**CEG303-4** Planning of public buildings.

**CEG303-5** Prepare presentation drawings

**CEG303-6** Development of residential buildings Plan.

## COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

[**Note: Correlation levels:** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation]

| Competency and COs  | Programme Outcomes POs and PSOs                  |                          |                                       |  |   |                         |                         |                         |                                      |                                  |
|---|--|--------------------------|---------------------------------------|--|---|-------------------------|-------------------------|-------------------------|--------------------------------------|----------------------------------|
|   | PO 1<br>Basic knowledge and Discipline Knowledge | PO 2<br>Problem Analysis | PO 3 Design /Development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering Practices for society, sustainability and environment | PO 6 Project Management | PO 7 Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b><br>Apply principles of Building Drawing to solve engineering problems. | 3  | 1                        | 3                                     | 3  | 1   | 1                       | 3                       | 3                       | 3                                    | -                                |
| <b>CEG303-1</b><br>Draw different types of lines.   | 3  | 3                        | 3                                     | -  | 1   | 1                       | 1                       | 3                       | 3                                    | -                                |
| <b>CEG303-2</b><br>Apply building bye laws for planning of building.                      | 3  | 3                        | 3                                     | -  | 1   | 1                       | 3                       | 3                       | 3                                    | -                                |
| <b>CEG303-3</b><br>Apply principles of planning for planning and design of building.      | 3  | 3                        | 3                                     | -  | 1   | 1                       | 3                       | 3                       | 3                                    | -                                |

| Competency and COs                                     | Programme Outcomes POs and PSOs                  |                          |                                       |  |   |                         |                            |                         |                                      |                                  |
|--|--|--------------------------|---------------------------------------|--|---|-------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|  | PO 1<br>Basic knowledge and Discipline Knowledge | PO 2<br>Problem Analysis | PO 3 Design /Development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering Practices for society, sustainability and environment | PO 6 Project Management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| CEG303-4<br>Planning of public buildings.              | 3  | 1                        | 1                                     | -  | 1   | 1                       | 3                          | 1                       | 1                                    | -                                |
| CEG303-5<br>Prepare presentation drawings              | 3  | 3                        | 3                                     | -  | 1   | 1                       | 2                          | 3                       | 3                                    | -                                |
| CEG303-6<br>Development of residential buildings plan. | 3  | 3                        | 3                                     | -  | 1   | 1                       | 3                          | 3                       | 3                                    | -                                |

## PRACTICALS/EXERCISES

### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:

Practical work is divided in two parts as below –

A) Drawing full imperial sheet on A1 paper.

B) Micro project.

| Sr. No. | Title of Practical/Exercise  | Skills/ Competencies to be developed   | Course outcome                                |
|---------|--|--|---|
| A       | <b>1</b><br>Measured Drawing – of small residential building (single storey) with minimum two rooms, kitchen, and sanitary block consisting of plan, Elevation, section, schedule of opening, site plan, and construction notes. | 1. Measure the units of existing building (Load bearing/ Framed structure)<br>2. Drawing of submission drawing | CEG303-3<br><br>CEG 303-1, CEG303-2, CEG303-3 |
|         | <b>2</b><br>Reading and interpreting ready made Architectural building drawing – (Drawing to be procured by student from consulting Engineer/ Architect) students should read and interpreting the drawing and write a report.   | 1. Observation of Technical details  | CEG 303-1, CEG303-2                           |
|         | <b>3</b><br>Submission drawing, to the scale 1:100, of single storied Load Bearing Residential Building (2BHKD) with Flat Roof and staircase showing developed   | Drawing of submission drawing  | CEG 303-1, CEG303-2, CEG303-3, CEG303-6       |

|          |   |  |  |
|----------|---|--|--|
|          | plan,<br>Elevation, section passing through Stair or<br>W.C. and Bath, site plan (1:200), area<br>Statement, schedule of openings and<br>construction notes.  |  |  |
| <b>4</b> | <b>Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHKD) with attached toilet to 1 bedroom</b> showing developed plan, elevation, section passing through staircase,<br>Site plan (1:200), area statement, schedule of openings and construction notes.   | Drawing of submission drawing  | CEG 303-1,<br>CEG303-2,<br>CEG303-3,<br>CEG303-6 |
| <b>5</b> | <b>Working drawing of above G+ 1 building</b> showing foundation plan (1:50), RCC column and footing, RCC beam, RCC Chajja and RCC staircase.   | Drawing of working drawing   | CEG303-3   |
| <b>6</b> | <b>Two Point Perspective Drawing of small objects</b> - steps, monuments, pedestals (any two) scale 1:50  | Drawing of presentation drawing  | CEG303-5   |
| <b>7</b> | <b>Line Plan</b> – Of any two public building on full imperial graph sheet.   | Drawing of public building   | CEG303-4   |
| <b>B</b> | <b>Suggested Micro-projects:<br/>Any one project for group of three to five students.</b><br>a) Prepare report on provisions given in National Building Code 2005.<br>b) Prepare report on building bye laws as per local authority<br>c) Prepare report on process and documents of building permission from competent authority<br>d) Develop plan of any public building<br>e) Draw one / Two point perspective of small building<br>f) Prepare a model of small building with waste packaging materials and apply principles of planning. | 1. Information collection and presentation in the form of report.<br><br>2. Motivation through field exposure.<br><br>3. Developing self learning ability. |  |



**CONTENT: THEORY**

**Section – I**

| Sr. No.  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|--|---|------------------|---------------------------|
| <i>Course Outcome- CEG303-1</i> Draw different types of lines.                                   |   |                  |                           |
| 1  | <p><b>Introduction</b></p> <p>1.1 Purpose of drawing, preliminary requirement of good drawing.</p> <p>1.2 Symbols &amp; notations as per IS 962:1989 in civil engineering drawing such as earth work, brick work, stone work, concrete, wood work and glass used in civil engineering. Symbols for door, window, sanitary, electrical installations.</p> <p>1.3 Types of lines-visible line, center line, hidden line, section line, dimension line, extension line, pointers, arrow heads or dots, north point. Scales for various types of drawings.</p> <p>1.4 Types of scales- Monumental, intimate, and human and shock scale. Selection of scale for specific drawing.</p>  | 05               | 06                        |
| <i>Course Outcome- CEG303-2</i> Apply building bye-laws for planning of building.                |   |                  |                           |
| 2  | <p><b>Agencies in Building construction work.</b></p> <p>2.1 Role of different agencies in building construction work – such as Owner, architects, structural engineer, contractor, promoter, quantity surveyor and supervisor, specialist of air conditioning, acoustics, lifts, interior decoration etc.</p> <p>2.2 <b>Building bye laws</b> –Definition, objectives of bye laws, The Municipalities, Corporations published their rules &amp; bye laws regarding building activities. Student is expected to know the following terminology – plot area, Margins, built – up-area, carpet area, plinth area, floor area, FAR/FSI</p> <p>2.3 <b>Plan sanctions authorities-</b> such as gram panchayat, Municipal Corporation, town planning etc.</p> <p>2.3.1 Procedure for submitting plan for sanctioning.</p> <p>2.3.2 List of documents required and number of copies.</p> | 05               | 08                        |
| <i>Course Outcome-CEG303-3</i> apply principles of planning for planning and design of building. |   |                  |                           |

|   |   |           |           |
|---|---|-----------|-----------|
| 3   | <p><b>Planning of Residential Building –</b></p> <p>3.1 Principles of planning of buildings –aspect, prospect, roominess, grouping, circulation, privacy, flexibility, furniture requirement, sanitation, elegance, economy, Orientation of Building</p> <p>3.2 Space requirements and norms for various units of residential buildings.</p> <p>3.3 Minimum / standard dimensions of various units such as W.C., Bath, Otta height , Plinth height , Window sill height , Garage height etc.</p> <p>3.4 Drawing line plan for residential building.</p> <p>3.5 Planning of staircase in available space, Working drawing of RCC staircase, column, column footing, Beam, chajja etc.</p> <p>3.6 Concept of Vastushastra for building planning. (only introduction )</p> | 07        | 10        |
| <i>Course Outcome -CEG303-4</i> Planning public buildings.  |   |           |           |
| 4   | <p><b>Planning of public buildings –</b></p> <p>4.1 Planning of public building such as school building, primary health centre or hospital building, post office, banks, hostels, restaurant etc. Units required for each type of building with their approximate sizes. Grouping of various units with their functional requirements.</p> <p>(In examination only line plans of the same should be used)</p>   | 04        | 06        |
| <i>Course Outcome -CEG303-5</i> Prepare presentation drawings   |   |           |           |
| 5   | <p><b>Perspective drawings –</b></p> <p>5.1 Definition, necessity and principles of perspective drawing.</p> <p>5.2 Terms used in perspective drawing such as picture plane, station point, vanishing point, angle of vision, center of vision etc.</p> <p>5.3 Types of perspective such as one point perspective, two point perspective</p> <p>5.4 Concept of one point and two point perspective and its application. (In examination small objects such as steps block, pedestal may be asked to draw one or two point perspective)</p>  | 04        | 10        |
| <b>Total</b>  |   | <b>25</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |   |           |           |

**Section II**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <i>Course Outcome - CEG303-6</i> Design of residential buildings.   |   |                  |                           |
| <b>6</b>  | <b>Drawing of residential Building</b><br>6.1 Detail development of line plan with orientation.<br>6.2 Elevation<br>6.3 Section<br>6.4 Site plan and North direction.<br>6.5 Preparing schedules of doors / windows<br>6.6 Calculation of areas such as plot area, built-up-area, carpet area, floor area, plinth area, F.S.I./F.A.R.<br>6.7 General construction notes, general specifications etc.<br>6.8 Foundation plan.<br><b>Note</b> – In examination a small single storied residential building load bearing/ framed structure for development of line plan should be asked. | <b>07</b>        | <b>40</b>                 |
|   | <b>Total</b>  | <b>07</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No.    | Name of topic                           | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|--------------|---|--|------------|-------------|----------------|-------------|
|              |   | Remember                                     | Understand | Application |                |             |
| 1            | Introduction                            | 04   | 02         | --          | CEG303-1       | 06          |
| 2            | Agencies in Building construction work. | 04   | 02         | 02          | CEG303-2       | 08          |
| 3            | Planning of Residential Building        | 04   | 04         | 02          | CEG303-3       | 10          |
| 4            | Planning of public buildings            | 02   | --         | 04          | CEG303-4       | 06          |
| 5            | Perspective drawings                    | 03   | 03         | 04          | CEG303-5       | 10          |
| 6            | Drawing of residential Building         | 10   | 10         | 20          | CEG303-6       | 40          |
| <b>TOTAL</b> |   | <b>27</b>                                    | <b>21</b>  | <b>32</b>   |                | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**Note – In Section II, line plan of small residential building shall be given & students are asked to prepare the following**

- |   |             |
|---|-------------|
| 1. Detailed plan                                      | - 10 marks  |
| 2. Front Elevation                                    | - 06 marks  |
| 3. Section (section line shall be given on line plan) | - 12 marks. |
| 4. Schedule of doors & windows                        | - 06 marks. |
| 5. Area statement, North Line                         | - 06 marks. |

**INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                              | Topic             |
|----|---|-------------------|
| 1. | Field Visits<br>1.Existing construction sites | For related topic |

**ASSESSMENT CRITERIA FOR PRACTICAL/ EXERCISE**

**i) Continuous Assessment of Practical/ exercise Work:**

Every practical assignment shall be assessed for 25 marks as per following criteria :

| Domain       | Particulars                | Marks out of 50 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**ii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted.

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

**Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio/ video presentations
4. Question Bank

**REFERENCE MATERIAL:**

**Books / Journals / IS Codes / Websites**

| Sr. No | AUTHOR   | TITLE                                      | PUBLISHER  |
|--------|--|--|--|
| 1.     | Building Drawing   | Shah, Kale, Patki                          | Tata Mgraw Hill, New Delhi   |
| 2.     | Building planning & drawing                                      | N Kumar Swamy<br>A KameswaraRao            | Charotar Publishing House,<br>Anand                                  |
| 3.     | Building Drawing   | M N Gangrade<br>B S Deshmukh, A K Kanitkar | NiraliPrakashan,<br>Pune   |
| 4.     | Civil Engg. Drawing  | Rangwala                                   | Charotar Publishing House,<br>Anand                                  |
| 5.     | Civil Engg. Drawing  | M. Chakraborti,                            | By author 21B,Bhabananda rd.<br>Culcutta. 700026.                    |
| 6.     | Planning &Design of Building                                     | Y.S. Sane                                  | Allied book stall Poona-4<br>And Engg. Book Publisher Co.<br>Pune-16 |
| 7.     | The text book of building drawing                                | S.V. Deodhar                               | New vrinda publishing house ,<br>M.G. Rd. Jalgaon.                   |
| 8.     | Civil Engg. Drawing  | R.S. Malik & G.S. Meo                      | New Asian publisher,<br>NaiSadak New Delhi                           |
| 9.     | Building rules & Bye-laws  | ---  | Municipal Corporation/ Town<br>Planning /Municipal Council.          |
| 10.    | IS code of practice for<br>Architectural and building<br>drawing | BIS, New Delhi.                            | Govt. Publication.   |
| 11.    | Principles of perspective drawing                                | M. G. Shah, C. M. Kale                     | McGraw Hill  |

**IS, BIS And International Codes:**

- SP-41 (S&T) (1987) ISI Hand book of functional requirements of building other than industrial building.
- SP-35(S&T)(1987) ISI Handbook water supply and drainage with special emphasis on plumbing.
- IS 962-1989 code of practice for architectural and building drawing.
- IS 1742-1972 code of practice for building drainage.
- SP-27 1987 (1987) Handbook of method of measurement of building works.
- Data book – National building code, CBRI

**b) Websites:**

[http://www.greenhome.com/sustainable\\_architecture.htm](http://www.greenhome.com/sustainable_architecture.htm)

[http://www.egaarchitect.com/upclose/vi/week23/vi\\_week23.pdf](http://www.egaarchitect.com/upclose/vi/week23/vi_week23.pdf)

\* \* \*

**COURSE ID:**

**Course Name** : **Computer Aided Drawing.**  
**Course Code** : **CEG304**  
**Course Abbreviation** : **GCAD**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : **Nil**

**Teaching scheme:**

| Scheme component | Hours / Week | Credits |
|------------------|--------------|---------|
| Theory           | -            | 04      |
| Practical        | 04           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment |                     | Term End Examination |                    | Total     |
|-----------------------|------------------------|---------------------|----------------------|--------------------|-----------|
|                       | Theory                 | Practical           | Theory Examination   | PR                 |           |
| Details of Evaluation |                        | One PST of 25 marks | @                    | As per Proforma-IV |           |
| Marks                 | -                      | --                  | @                    | <b>50* I</b>       | <b>50</b> |

\*\* (To be assessed by External examiner)

@. No theory end examination

**Rationale:**

Computers are used in each and every sphere of life. Numbers of civil engineering software packages are available and are used in different organizations. In this, Computer aided drawing as drafting software to draw, read and interpret the civil engineering drawing is now very much essential. This will increase speed and accuracy of drawing as well as give facilities to repetitive use of drawing as and when needed.

**COMPETENCY**

Apply and use of various commands of Auto CAD to prepare various drawings.

**Cognitive:** Understanding and applying commands available in software to generate various drawing

**Psychomotor: i)** drawing - graphic constructions

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

**COURSE OUTCOMES:**

**CEG304-1** Know different types of latest of software's.

**CEG304-2** Know contents available in CAD packages.

**CEG304-3** Understand draw and modify commands.

**CEG304-4** Generate submission drawing of residential building

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[**Note: Correlation levels:** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”: no correlation]

| Competency and COs   | Programme Outcomes POs and PSOs                  |                          |   |  |   |                            |                            |                         |                                      |                                  |
|--|--|--------------------------|---|--|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|  | PO 1<br>Basic knowledge and Discipline Knowledge | PO 2<br>Problem Analysis | PO 3<br>Design/Development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering Practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b><br>Apply and use of various commands of Auto CAD to prepare various drawings. | 3  | 3                        | 3                                       | 2  | 2   | -                          | -                          | 3                       | 3                                    | ---                              |
| <b>CEG304-1</b><br>Know different types of latest of software's.                                 | 3  | 2                        | 2                                       | -  | 2   | -                          | -                          | 2                       | 2                                    | ---                              |
| <b>CEG304-2</b><br>Know contents available in CAD package.                                       | 3  | 3                        | 3                                       | 3  | 2   | -                          | -                          | 2                       | 2                                    | --                               |
| <b>CEG304-3</b><br>Understand draw and modify commands.  | 2  | 3                        | 3                                       | 1  | 1   | -                          | -                          | 3                       | 3                                    | ---                              |
| <b>CEG304-4</b><br>Generate submission drawing of residential building                           | 3  | 3                        | 2                                       | 2  | 3   | -                          | -                          | 2                       | 3                                    | ---                              |



## PRACTICALS/EXERCISES

### Practical/ Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:

Practical work is divided in two parts as below –

A) Practical/ Exercise.

B) Micro project.

| Sr No. | Title of Practical Exercise | Skills / Competencies to be developed   | Course Outcome  |                             |
|--------|-----------------------------|---|---|-----------------------------|
| A      | 1                           | Demonstration the components of CAD screen and apply the process of initial setting using format menu | 1. Presentation,<br>2. Motivation through software exposure | CEG304-1<br>and<br>CEG304-2 |
|        | 2                           | Starting Auto CAD and Demonstration of auto-CAD commands as mentioned in topic no. 3                  | 3. Presentation,<br>4. Motivation through software exposure | CEG304-1<br>and<br>CEG304-2 |
|        | 3                           | Writing the names of the all commands and Short Keys  | 1. Self learning ability<br>2. Time management              | CEG304-3                    |
|        | 4                           | Exercise on establishing limits and units of the proposed drawing                                     | 1. Planning proper space<br>2. Choice of proper scale       | CEG304-3                    |
|        | 5                           | Exerciser on Use of ortho, grid, snap, Line weight, and osnap, Polar commands                         | 3. Applying concepts studied                                | CEG304-3                    |
|        | 6                           | Drawing triangles, rectangles, pentagon, circle etc using various commands with dimensions            | 4. Drawing diagrams<br>5. Time management                   | CEG304-3                    |
|        | 7                           | Layers – Drawing line sketch of three rooms residential building on different layers                  | 6. Self learning ability<br>7. Presentation skills          | CEG304-3                    |
|        | 8                           | Hatching an object say brick work, stone masonry, bed concrete, sand filling, grill work etc.         |   | CEG304-3                    |
|        | 9                           | Reducing and increasing the dimension of a rectangular object / room using ‘stretch’ command          |   | CEG304-3                    |
|        | 10                          | Increasing or decreasing the size of an object using ‘scale’ command                                  |   | CEG304-3                    |
|        | 11                          | Calculating the area of the given figure  |   | CEG304-3                    |

|   |    |  |   |                       |
|---|----|--|---|-----------------------|
|   | 12 | Drawing the plan of a building showing living room, bedroom, kitchen, WC and bath, staircase etc   |   | CEG304-3 and CEG304-4 |
|   | 13 | Drawing elevation and section for serial no. 12  |   | CEG304-3 and CEG304-4 |
|   | 14 | Preparing area statement, site plan, construction notes, schedule of doors and windows etc. for serial no. 12 & 13   |   | CEG304-3 and CEG304-4 |
|   | 15 | Demonstration and taking printout (preferably on plotter) of serial no. 12 to 14   |   | CEG304-3 and CEG304-4 |
|   | 16 | Writing short notes on topic no. 1, 2 and 3  | 1. Self learning ability  | CEG304-1 to CEF304-3  |
| B |    | <p><b>Suggested Micro-projects:</b></p> <p><b>Any one project for group of three to five students.</b></p> <p>1) Draw Plan, elevation and section of a collected framed structure drawing from builder/Architect/ civil engineer.</p> <p>2) Prepare construction notes, site plan and schedule of openings from the framed structure collected from builder/Architect/ civil engineer.</p> <p>3) Draw Plan, elevation and section of a collected load bearing structure drawing from builder/Architect/ civil engineer.</p> <p>4) Prepare construction notes, site plan and schedule of openings from the load bearing structure collected from builder/Architect/ civil engineer.</p> <p>5) Draw working drawing of available drawing from builder/Architect/ civil engineer.</p> <p>6) Learn latest software's of Civil Engg Drawing</p> | <p>1. Information collection and presentation in the form of report.</p> <p>2. Motivation through field exposure.</p> <p>3. Developing self learning ability.</p> |                       |

**Note - Student will submit print-outs of all the practical's and short notes of topic no. 1,2,3**

**CONTENT: THEORY**

| Sr. no.  | Topics  |
|--|---|
| <i>Course Out come- CEG304-1</i> Know different types of latest of software's.       |   |
| 1  | <p><b>A brief study of latest software in Civil Engineering</b></p> <p>Eg. STADD, STADPRO, AUTO CIVIL, 3D MAX, 3D HOMEARCHITECT, STARDYNE, STRUDD, PROENGINEERS, etc.</p>   |
| <i>Course Out come- CEG304-2</i> Know contents available in CAD pakage.              |   |
| 2  | <p><b>A brief knowledge about CAD-packages available</b></p> <p>Eg. Auto CAD, Omega designer, P-CAD, Robo CAD, SD max, Felix CAD, Intelli CAD, etc.</p>   |
| <i>Course Out come- CEG304-3</i> Understand draw and modify commands.                |   |
| 3  | <p><b>Auto-CAD package</b></p> <p>3.1 WCS icon, UCS icon, Co-ordinates, drawing limits units etc.</p> <p>3.2 Draw commands: line, ray, poly line, SP-line, construction line, rectangle, polygon, ellipse, hatch, circle, arc, etc.</p> <p>3.3 Modify Commands : match property, erase, copy, mirror, offset, move, rotate, scale, stretch, trim, extend, break, join, chamfer, fillet, explode, divide, lengthen etc</p> <p>3.4 Dimension commands: linear, aligned, arc length, ordinate, radius, diameter, centimeter, angular, style etc.</p> <p>3.5 Layers Adding: a new layer, Layer on/off, Freeze/Thaw, Lock/Unlock etc.</p> <p>3.6 Insert commands : make block, insert block, roster image etc.</p> |
| <i>Course Out come- CEG304-4</i> Generate submission drawing of residential building |   |
| 4  | <p><b>Submission drawings</b></p> <p>4.1 Generation of plan of a building (on layers)<br/>Generation of detailed plan, elevation, section, site plan, area statement, schedule of doors and windows of a residential building</p>   |

**Note - Above theory content will be delivered in practical hours.**

**ASSESSMENT CRITERIA FOR PRACTICAL/ EXERCISE EXAMINATIO**

**a) Assessment Criteria for Practical/Exercise work :**

**i) Continuous Assessment of Practical/ Exercise work:**

Every practical assignment shall be assessed for 50 marks as per following criteria:

| Domain       | Particulars                         | Marks out of 50 |
|--------------|-------------------------------------|-----------------|
| Cognitive    | Presence and Understanding          | 05              |
|              | Application                         | 05              |
| Psychomotor  | Operating Skills                    | 10              |
|              | Drawing / drafting skills           | 10              |
| Affective    | Discipline and punctuality          | 10              |
|              | Regular assessment and presentation | 10              |
| <b>TOTAL</b> |                                     | <b>50</b>       |

**ii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* shall be conducted

**Assessment Criteria for Practicle/Oral Examination:**

For conducting the Practical examination, Minimum of 5 examples on various commands is to be asked to perform *and PR/OR assessment as per Pro-forma IV.*

**INSTRUCTIONAL STRATIGES:**

**Instructional Methods:**

1. Lectures cum demonstrations
2. Laboratory practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20 of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

**Suggested Micro-projects:**

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students are to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma. A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by concerned faculty.

**Learning resources:**

1. Computer
2. Computer based training packages.
3. LCD Presentations

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**REFERENCE MATERIAL:**

**Reference books:**

| <b>Sr.No</b> | <b>AUTHOR</b>                 | <b>TITLE</b>                              | <b>PUBLISHER</b>             |
|--------------|-------------------------------|---|------------------------------|
| 1.           | George Omura, Brian C. Benton | Mastering Auto CAD                        | SYBEX, U.S.A.                |
| 2.           | Prof. Sham Tickoo             | Auto CAD 2016 for Engineers and Designers | Dream tech, USA              |
| 3.           | David Frey                    | AutoCAD                                   |                              |
| 4.           | RajendraSolkhe                | AutoCAD                                   | Aruta Publishers,<br>Chiplun |
| 5.           | TickorMaini                   | Understanding Autocad                     |                              |

**COURSE ID :**

**Course Name : SOIL MECHANICS AND FOUNDATION ENGINEERING**  
**Course Code : GSMF**  
**Course Abbreviation : CEG305**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CCG110**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                                  | Total |
|-----------------------|---------------------------------------|---|---------------------------------|----------------------------------|-------|
|                       | Theory                                | Practical   | Theory                          | ORAL                             |       |
| Details of Evaluation | Average of two tests of 20 marks each | 1. 25 marks for Continuous Assessment<br>2. 25 marks Progressive skill test<br>3. 25 marks for microproject | Term End Theory Exam (03 hours) | Internal oral as per Proforma IV |       |
| Marks                 | 20                                    | --  | 80                              | 50 I                             | 150   |

**RATIONALE:**

As all structures ultimately rest on the earth's surface, study of behavior of soils under mechanical forces is important. Understanding the nature of the basic parameters to be considered in the design is more important in Foundation Engineering. This subject deals with study of engineering behavior of soil and foundation.

**COMPETENCY:**

Apply principles of soil mechanics to engineering problems as follows:

**Cognitive:** Understanding and applying principles of structural mechanics to engineering problems

**Psychomotor:** i) Experimentation skills ii) graphic skills

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality

**COURSE OUTCOMES:**

**CEG305-1** State basic properties of soil and classify soil

**CEG305-2** Explain and solve simple problems on permeability and seepage

**CEG305-3** Explain soil shear strength, compaction and stabilization

**CEG305-4** Explain site investigation and earth pressure

**CEG305-5** Explain shallow and deep foundations

**CEG305-6** Explain construction of foundations and machine foundations

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs   | Programme Outcomes POs and PSOs      |                       |                                       |  |   |                         |                         |                      |                                   |                               |
|--|--------------------------------------|-----------------------|---------------------------------------|--|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
|  | PO 1 Basic and disciplined knowledge | PO 2 Problem analysis | PO 3 Design /development of solutions | PO 4 Engineering Tools/experimentation and testing | PO 5 The engineering practice for society, sustainability and environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
| <b>Competency:</b> Apply principles of soil mechanics to solve engineering problems. | 3                                    | 2                     | 3                                     | 2  | 2   | -                       | 2                       | 1                    | 1                                 | 2                             |
| <b>CEG305-1</b> State basic properties of soil and classify soil                     | 2                                    | 1                     | 1                                     | 2  | -   | -                       | 1                       | -                    | -                                 | 1                             |
| <b>CEG305-2</b> Define and solve simple problems on permeability and seepage         | 2                                    | 1                     | 1                                     | 2  | -   | -                       | 2                       | 1                    | 1                                 | 1                             |
| <b>CEG305-3</b> Explain soil shear strength, compaction and stabilization            | 2                                    | 3                     | 3                                     | 1  | 2   | -                       | 1                       | 1                    | 1                                 | 1                             |
| <b>CEG305-4</b> Explain site investigation and earth pressure                        | 2                                    | 3                     | 2                                     | 1  | 2   | -                       | 2                       | 2                    | 1                                 | 1                             |
| <b>CEG305-5</b> Explain shallow and deep foundations                                 | 2                                    | 3                     | 2                                     | -  | 1   | 1                       | 2                       | 1                    | 2                                 | 1                             |
| <b>CEG305-6</b> Explain construction of foundations and machine foundation           | 2                                    | 3                     | 1                                     | -  | 1   | 1                       | 1                       | 1                    | 1                                 | 1                             |

**A) Laboratory Experiments:**

*Laboratory Manual on Soil Mechanics* developed by the Institute shall be used for practical work.

Practical work shall consist of the following laboratory experiments:

| Sr. No.  | Laboratory Experience   | Skills / Competencies to be developed                           |                 |
|----------|---|---|-----------------|
| <b>a</b> | Any <b>eight</b> Experiments  |   |                 |
| 1        | Determination of water content by oven drying method                        | Follow IS code procedures for tests.                            | <b>CEG305-1</b> |
| 2        | Determination of specific gravity by pycnometer method.                     | Studying equipment.   | <b>CEG305-1</b> |
| 3        | Mechanical analysis of soil   |   | <b>CEG305-1</b> |
| 4        | Determination of liquid limit and plastic limit.                            | Understanding test procedure<br>Accuracy in taking observation. | <b>CEG305-1</b> |
| 5        | Determination of field unit weight by core cutter method.                   | Reinforcement of Concepts.                                      | <b>CEG305-1</b> |
| 6        | Determination of field unit weight by sand replacement method.              | Performing calculation and plotting graphs. from                | <b>CEG305-1</b> |
| 7        | Determination of soil permeability by lab test                              | observation.  | <b>CEG305-2</b> |
| 8        | Determination of OMC and MDD by standard Proctor test                       |   | <b>CEG305-3</b> |
| 9        | Determination of shear strength by direct shear                             | Interpreting test results.                                      | <b>CEG305-3</b> |
| 10       | Determination of CBR by laboratory/Field method                             | Classifying materials as per IS standards.                      | <b>CEG305-3</b> |
| <b>b</b> | Preparation of Site visit report on shallow or deep foundation/ earthen dam | Finding quality of material.                                    | <b>CEG305-5</b> |



**B. Micro Projects: One project for group of 4/5 students**

1. Demonstration through video film of plate load test/Standard penetration test/Compaction proctor needle/ Foundation excavation /Coffer dams /caisson and write report on it
2. Collection of photographs used for compaction and soil stabilization
3. Collection of soil from different region and study physical properties of it and to enter values of it in department record.
4. Collection of soil investigation report.
5. Chart of IS codes for different test on soils
6. Chart of is code specifications used for machines/apparatus used for experiments
7. Collection of geotechnical reports of structure.
8. Calculations for experiments and to draw different graphs etc. in excel or any other software and prepare a report.
9. Collection of information and photographs regarding soil investigation.
10. Collection of information and photographs of soil support systems while footing construction.
11. Any other microprojects suggested by the teacher.

**C. INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                     | Topic                     |
|----|--------------------------------------|---------------------------|
| 1. | Field examples of course application | Topics of theory syllabus |
| 2. | Field examples of course application | Practical assignments     |

**Assessment Criteria for Term End Oral Examination:**

At least two questions, based on term work produced by the candidate, each of knowledge level, comprehension and application level shall be asked by the examiner during the oral examination.

**D) THEORY**

**Section I**

| Sr. no.   | Topics  | Teaching (Hours) | Theory evaluation Marks |
|---|---|------------------|-------------------------|
| Course Outcome : <b>CEG305-1</b> State basic properties of soil and classify soil |   |                  |                         |
| 1.  | <p><b>Properties of soil and soil classification</b></p> <p><b>1.1 Overview of Soil Mechanics...(04 marks)</b><br/>Definition of soil. Formation of soil. Importance of soil in civil engineering as construction material and as foundation bed. Field applications of soil mechanics: for foundation design, pavement design, design of earth retaining structures, design of earthen dams</p> <p><b>1.2 Basic Properties of Soil...(10 marks)</b><br/>Composition of Soil : Three phase system, weight relationships, Volume relationship, Void ratio, Porosity, Inter-relationships between Water content, Degree of saturation, Specific gravity, Experimental determination of water content, unit weight, specific gravity<br/>Consistency of clay soils, stages of consistency, Atterberg's limits of consistency, plasticity index, determination of liquid limit, plastic limit, shrinkage limit</p> <p><b>1.3 Soil Classification ...(06 marks)</b><br/>Need for soil classification, Criteria for classification, Grain size classification, Classification based on plasticity, Symbols and graphical representation Mechanical analysis, Particle size distribution curve, Effective diameter of soil, Uniformity coefficient, Coefficient of curvature</p> | 12               | 20                      |
| CEG305-2 Explain and solve simple problems on permeability and seepage            |   |                  |                         |
| 2   | <p><b>Permeability, Seepage and Capillarity</b></p> <p>2.1 Soil moisture-modes of occurrence. adsorbed water, capillary water, free water,<br/>2.2 Flow of water through soil-permeability, Factors affecting permeability, Darcy's law, Determination of permeability – lab test, Values of permeability for different soils.<br/>2.3 Capillary phenomenon in soils<br/>2.4 Shrinkage and Swelling in soils.<br/>2.5 Seepage through earthen structures, seepage forces, phreatic line, flow lines, equi-potential lines, flow net, characteristics of flow net, quick sand, application of flow net. (no numerical problems)</p>  | 04               | 08                      |

| <b>Course Outcome: CEG305-3</b> Explain soil shear strength, compaction and stabilization   |   |           |           |
|---|---|-----------|-----------|
| <b>3</b>  | <b>Shear Strength of Soil, Soil Compaction and Stabilization</b>  | <b>08</b> | <b>12</b> |
|   | <p><b>3.1 Shear strength of soils ...(06 marks)</b><br/>           Concept of shear in soil. Cohesion and Internal friction, Coulomb's theory and failure envelop. Strength equation<br/>           Representation of stresses by Mohr's circle.<br/>           Cohesive, non-cohesive, saturated, partly saturated soil.<br/>           Factors affecting shear strength. Study of Direct shear test. List of other methods</p> <p><b>3.2 Soil Compaction and Stabilization (06 marks)</b><br/>           Compaction phenomenon, Purpose, field application, standard Proctor test, modified proctor test, Compaction curve, factors affecting compaction, Field methods of compaction. Proctor needle.<br/>           Soil stabilization: definition, Necessity, Introduction to methods of stabilization,<br/>           CBR test- Laboratory and field test</p> |           |           |
|   | <b>Total</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

## Section II

| Sr. no.  | Topics<br>Subtopics  | Teaching<br>(Hours) | Theory<br>Evaluati<br>on<br>Marks |
|--|--|---------------------|-----------------------------------|
| <b>Course Outcome : CEG305-4</b> Explain site investigation and earth pressure |  |                     |                                   |
| <b>4</b>   | <p><b>Site investigation and Earth Pressure</b></p> <p><b>4.1 Site Investigation: ...(06 marks)</b><br/>           Necessity of site investigation, Methods such as Trial pit, Borings, Geophysical, Criteria for deciding location and number of pits and bores, Soil sampling, disturbed and undisturbed samples</p> <p><b>4.2 Earth Pressure ...(04 marks)</b><br/>           Lateral earth pressure, Rankine's theory, Coulomb's wedge theory<br/>           Concept of earth pressure. Types of earth retaining structures, stability considerations.</p> | <b>06</b>           | <b>10</b>                         |
| <b>Course Outcome : CEG305-5</b> Explain shallow and deep foundations          |  |                     |                                   |
| <b>5</b>   | <p><b>Foundations</b></p> <p><b>5.1 Shallow Foundations ...(12 marks)</b><br/>           Shallow foundation types – spread, strap, combined, raft.<br/>           Pressure distribution beneath rigid footing.<br/>           Concept of bearing capacity, Ultimate, Safe, Allowable bearing capacity.<br/>           Bearing capacity concept &amp; equation (IS), (No derivation and problems),</p>  | <b>11</b>           | <b>18</b>                         |

|   |  |           |           |
|---|--|-----------|-----------|
|   | <p>effect of water table<br/>Presumptive bearing capacity values of different types of soils.<br/>Plate load test, Standard penetration test.<br/>Foundation settlement, permissible settlement<br/>Factors deciding depth of foundation, Foundation on sloping ground</p> <p><b>5.2 Deep Foundations ...(06 marks)</b><br/>Use and classification of piles, Under-reamed piles, pile cap<br/>Well foundation – type, Caissons, Introduction to Pier foundations</p>   |           |           |
| <b>Course Outcome : CEG305-6</b> Explain construction of foundations and machine foundation   |  |           |           |
| <b>6</b>  | <p><b>6.1 Foundation Construction and Protection ...(08 marks)</b><br/>Soil support methods while excavation, sheet piles, Soldiers and Lagging, struts, Rackers, Tiebacks, Diaphragm walls<br/>Cofferdam types, Dewatering methods ,Effect of ground chemicals, sea action<br/>On concrete, industrial waste, corrosion of reinforcement, Protection of foundation</p> <p><b>6.2 Machine Foundations ...(04 marks)</b><br/>Types of Machine Foundations. Requirements of machine Foundations.<br/>Vibration Isolation</p> | <b>07</b> | <b>12</b> |
|   | <b>Total</b>   | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above and the candidates can attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination**

| Topic No. | Name of topic   | Distribution of marks (cognitive level wise) |               |             | Total Marks |
|-----------|---|--|---------------|-------------|-------------|
|           |   | Remember                                     | Understanding | Application |             |
| 1         | Properties of soil and soil classification                | 04   | 08            | 08          | 20          |
| 2.        | Permeability, Seepage and Capillarity                     | 02   | 02            | 04          | 08          |
| 3.        | Shear Strength of Soil, Soil Compaction and Stabilization | 02   | 04            | 06          | 12          |
| 4.        | Site investigation and Earth Pressure                     | 02   | 04            | 04          | 10          |
| 5.        | Foundations   | 04   | 04            | 10          | 18          |
| 6.        | Foundation construction and protection                    | 02   | 04            | 06          | 12          |
|           | <b>Total</b>  | <b>16</b>                                    | <b>26</b>     | <b>38</b>   | <b>80</b>   |

## IMPLEMENTATION STRATEGY :

### Instructional Methods:

1. Lectures cum demonstrations
2. Laboratory practices
3. Field visit
4. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
5. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assigned to him/her in the beginning of the semester. The groups of students are to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Oral examination should be considered and should be entered in relevant pro-forma. A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by concerned faculty.

### Teaching and Learning Resources:

1. Chalk & Black-board
2. Audio-visual aids
3. Laboratory manual
4. Question Bank

### Reference Books:

| Sr. No. | AUTHOR                       | TITLE                            | PUBLISHER                       |
|---------|------------------------------|----------------------------------|---------------------------------|
| 1.      | Gopal Ranjan & A.S.R. Rao    | Basic and Applied Soil Mechanics | New Age International Publisher |
| 2.      | C. Venkatramaiah             | Geotechnical Engineering         | New Age International Publisher |
| 3.      | B.C.Punmia                   | Soil Mechanics                   | C.Jamanadas & Co                |
| 4.      | Dr. S. B. Sehgal             | Soil Mechanics                   | CBS Publisher & Distributor     |
| 5.      | P. C. Varghese               | Foundation Engineering           | Prentice –Hall of India         |
| 6.      | N. V. Nayak                  | Foundation Design Manual         | Dhanpat Rai Publications        |
| 8.      | Shashi Gulhati & Manoj Datta | Geotechnical Engineering         | Tata Mcgraw-Hill                |

### Websites :

- [http://www.waterresources.rajasthan.gov.in/6guidelines\\_soil\\_prop.asp](http://www.waterresources.rajasthan.gov.in/6guidelines_soil_prop.asp)
- <http://www.youtube.com/watch?v=8mdSmB3CtZM>
- [http://www.youtube.com/watch?v=6pjlw\\_0a4](http://www.youtube.com/watch?v=6pjlw_0a4)

\* \* \*

**COURSE ID :**

**Course Name : HYDRAULICS**  
**Course Code : CEG306**  
**Course Abbreviation : GHYD**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CCG110**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 04           | 06      |
| Practical        | 02           |         |

**Evaluation Scheme**

| Mode of Evaluation    | Progressive Assessment                                     |   | Term End Examination            |                     | Total |
|-----------------------|--|---|---------------------------------|---------------------|-------|
|                       | Theory   | Oral/Practical                          | Theory Examination              | Oral                |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | One Progressive Skill Tests of 25 marks | Term End Theory Exam (03 hours) | As per Proforma-III |       |
| Marks                 | 20   | --                                      | 80                              | 50 E                | 150   |

**RATIONALE:**

Hydraulics is a branch of engineering science deals with behaviour of fluids at rest as well as in motion. Physical properties of water will play an important role in the water retaining structures like tanks, barrages, dams & water conveyance structures like pipes, open channels, canals. The empirical formulae developed in hydrostatics have found useful application in several problems. The measurement of flow of water in pipes and canals are useful in water supply system and assessment of water in irrigation field.

**COMPETENCY**

Apply principles of Hydraulics to solve engineering problems as follows.

**Cognitive:** Understanding and applying principles of Hydraulics to engineering problems.

**Psychomotor:** i) Designing the distribution system ii) Fixing the capacity of pumps iii) Designing most economical section of open channels.

**Affective:** Attitude of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation  
iv)Hygienevi) civic sense

**COURSE OUTCOMES:**

**CEG306-1** Interrelate physical properties of fluid & Interpret the pressure parameters from pressure Measuring devices in flowing liquids.

**CEG306-2** Determine total hydrostatic pressure and center of pressure for different conditions.

**CEG306-3** Apply continuity equation & Bernoulli's theorem for calculations.

**CEG306-4** Determine loss of head & flow through pipes.

**CEG306-5** Calculate discharge through open channels

**CEG306-6** Select relevant hydraulic pumps for different applications.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation

| Programme Outcomes POs and PSOs   |   |                          |   |  |   |                            |                            |                          |                                      |                                  |
|---|---|--------------------------|---|--|---|----------------------------|----------------------------|--------------------------|--------------------------------------|----------------------------------|
| Competency and COs  | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO 1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of environmental engineering (water supply and sanitary engineering) to solve engineering problems. | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                        | 3                                    | 2                                |
| <b>CEG306-1</b> Interrelate physical properties of fluid Interpret the pressure parameters from pressure measuring devices inflowing    | 3   | 3                        | 3                                       | 2  | 1   | 2                          | 2                          | 3                        | 1                                    | 2                                |
| <b>CEG306-2</b> Determine total hydrostatic pressure and center of pressure for different conditions.                                   | 3   | 3                        | 2                                       | 2  | 2   | 2                          | 2                          | 3                        | 3                                    | 2                                |
| <b>CEG306-3</b> Apply continuity equation & Bernoulli's theorem for calculations.   | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                        | 3                                    | 2                                |
| <b>CEG306-4</b> Determine loss of head & flow through pipes.  | 3   | 3                        | 3                                       | 2  | 2   | 1                          | 1                          | 3                        | 3                                    | 2                                |
| <b>CEG306-5</b> Calculate discharge through open channels   | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                        | 3                                    | 2                                |
| <b>CEG306-6</b> Select relevant hydraulic pumps for different applications.   | 3   | 3                        | 3                                       | 2  | 2   | 2                          | 2                          | 3                        | 3                                    | 1                                |

**A) PRACTICAL/EXERCISE WORK -**

**Practical Exercises and related skills to be developed:**

The following practical exercises shall be conducted as continuous assessment practical sessions of batches of 20 students:

Continuous assessment work is dividing two parts as below –

1. **Experimental work.**
2. **Micro-projects**

| Sr No. | Title of Practical Exercise  | Skills / Competencies to be developed   | Course Outcome  |
|--------|--|---|---|
| 1      | <p><b>Experimental work–</b></p> <ol style="list-style-type: none"> <li>1. Verification of Bernoulli's theorem</li> <li>2. Determination of coefficient of discharge for a given Venturimeter.</li> <li>3. Determination of hydraulic coefficients for sharp edge orifice.</li> <li>4. Determination of coefficient of discharge for given rectangular or triangular notch.</li> <li>5. Determination of Darcy's friction factor for a given pipe</li> <li>6. Determination of Minor losses in pipes (any two)</li> <li>7. Study and use of Moody's diagram &amp; Nomograms for design of pipelines</li> <li>8. Study of a model of centrifugal and reciprocating pump.</li> <li>9. Study &amp; use of water meter.</li> </ol> | <ol style="list-style-type: none"> <li>1. Principle of conservation of mass</li> <li>2. Discharge measurement</li> <li>3. Relation of between Cc, Cv and Cd</li> <li>4. The canal /field channel discharge</li> <li>5. Head loss calculations for straight length pipe .ie. major losses</li> <li>6. The actual values of Minor losses</li> <li>7. The procedure of design of distribution pipe networks</li> <li>8. The selection of different pumps for different purposes</li> <li>9. The quantity measurement for charging</li> </ol> | <p>CEG306-4</p> <p>CEG306-4</p> <p>CEG306-4</p> <p>CEG306-5</p> <p>CEG306-4</p> <p>CEG306-4</p> <p>CEG306-4</p> <p>CEG306-6</p> <p>CEG306-6</p> |
| 2      | <p><b>Suggested Micro-projects:</b></p> <p><b>Any one project for group of three to five students.</b></p> <ol style="list-style-type: none"> <li>1. Collect the information of different types of pumps for selection of type of pump.</li> <li>2. Suggest the relevant type of Pump for typical bungalow/single storey building for the given data.</li> <li>3. Design a channel for a given specific discharge.</li> <li>4. Determine the total head loss for a multistory building.<br/>Measure the discharge of the channel by using triangular notches of different angle</li> </ol>   | <ol style="list-style-type: none"> <li>1. Information collection and presentation in the form of report.</li> <li>2. Motivation through field exposure.</li> <li>3. Developing self learning ability.</li> </ol>  |   |



**B) CONTENT : THEORY**

**SECTION I**

| Sr. No   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <i>Course Outcome -CEG306-1</i> Interrelate physical properties of fluid & Interpret the pressure parameters from pressure measuring devices in flowing liquids.   |  |                  |                           |
| <b>1</b>   | <b>Properties of fluid &amp; pressure measurement</b><br>1.1 Definition of fluid, Hydraulics. Branches of hydraulics. Importance of Hydraulics with respect to Irrigation and Environmental engineering.<br>1.2 Physical properties of fluid Mass density, Weight density, Specific volume, Specific gravity, Surface tension capillarity, Compressibility, Viscosity, Dynamic and kinematic viscosity. Ideal and Real fluids.<br>1.3 measurement of pressure, piezometer, simple U-tube manometer, differential manometer, Bourdon's pressure gauge, inverted differential U tube manometer | <b>09</b>        | <b>12</b>                 |
| <i>Course Outcome -CEG306-2</i> Determine total hydrostatic pressure and center of pressure for different conditions.  |  |                  |                           |
| <b>2</b>   | <b>Hydrostatic pressure&amp; its Measurement</b><br>2.1 Liquid pressure, pressure at point in liquid, Pascal's law, Variation of pressure and pressure diagram.<br>2.2 Atmospheric pressure, gauge and absolute pressure<br>2.3 Total pressure and centre of pressure on horizontal, vertical and inclined surfaces. Pressure acting on sluice gates and dam bodies  | <b>13</b>        | <b>16</b>                 |
| <i>Course Outcome -CEG306-3</i> Apply continuity equations & Bernoulli's theorem for calculations.   |  |                  |                           |
| <b>3</b>   | <b>Fundamentals of fluid flow</b><br>3.1 Concept of flow, Gravity flow and pressure flow, Types of flow – steady and Unsteady, uniform and non-uniform, Laminar and turbulent, Reynolds number and its application. Streamline and equipotential line, flow net and its uses.<br>3.2 Discharge and its unit, Continuity equation, Bernoulli's theorem, Loss of head and modified Bernoulli's theorem,  | <b>10</b>        | <b>12</b>                 |
|  | <b>Total</b>   | <b>32</b>        | <b>40</b>                 |
| (Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |  |                  |                           |

**Section – II**

| Sr. No  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <i>Course Outcome -CEG306-4 Determine losses of head &amp; flow through pipes.</i>  |   |                  |                           |
| <b>4</b>  | <b>Flow of liquid through pipes &amp; measuring devices</b><br>4.1 Loss of head due to friction, Darcy – weisbach equation, friction factor, and relative roughness, moody’s diagram and its use, common range of friction factor for different types of pipe material.<br>4.2 Minor losses in pipe flow, loss of head due to sudden Contraction, sudden expansion, at entrance and exit of pipe in various pipe fittings, pipes in series and parallel, equivalent pipe, Dupuit’s equation.<br>4.3 Hydraulic gradient line, Siphon pipe, Water hammer in pipes, causes and its effects and remedial measures. Moody’s Chart, Use of Nomograms for design of water distribution system.<br>4.4 Venturimeter - Component parts, principle of working, Study and use.<br>4.5 Flow through Orifice - Definition and use, Types of orifice based on various criteria. Coefficient of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice Determination of hydraulic coefficient of orifice | <b>16</b>        | <b>18</b>                 |
| <i>Course Outcome -CEG306-5 Calculate discharge through open channels</i>   |   |                  |                           |
| <b>5</b>  | <b>Flow through open channel &amp; measuring devices</b><br>5.1 Types of channels - artificial & natural, purposes of artificial channel, Geometrical properties – wetted area, wetted Perimeter, hydraulics radius of trapezoidal and rectangular sections, prismatic channel sections<br>5.2 Chezy’s and Manning’s equation of velocity for calculation of discharge through an open channel. Most economical channel section, conditions for most economical channel Velocity measuring devices for open channels sections.<br>5.3 Hydraulic Jump – Study & Uses<br>5.4 Velocity measuring devices for open channels. Floats, Pitot tube, current meter and its types.<br>5.5 Weir & Notches, expression for discharge for rectangular and triangular notches, Francis formula, end contraction and velocity of approach, Broad crested weir, cippolletti weir and expression for discharge through it.  | <b>12</b>        | <b>16</b>                 |
| <i>Course Outcome -CEG306-6Select relevant hydraulic pumps for different applications.</i>  |   |                  |                           |
| <b>6</b>  | <b>Hydraulic machines</b><br>6.1 Pumps - Definition and types, types of heads, types of pumps: centrifugal and reciprocating, component parts, sketches, priming, Calculation of HP of pump for various needs. Selection & choice of pump.  | <b>04</b>        | <b>06</b>                 |
|   | <b>Total</b>  | <b>32</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |

| Topic No. | Name of topic   | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---|--|------------|-------------|----------------|-------------|
|           |   | Remember                                     | Understand | Application |                |             |
| 1         | Properties of fluid                                   | 04   | 04         | 04          | CEG306-1       | 12          |
| 2         | Hydrostatic pressure & Measurement of liquid pressure | 04   | 04         | 08          | CEG306-2       | 16          |
| 3         | Fundamentals of fluid flow                            | 02   | 04         | 06          | CEG306-3       | 12          |
| 4         | Flow of liquid through pipes & measuring devices      | 04   | 06         | 08          | CEG306-4       | 18          |
| 5         | Flow through open channel & measuring devices         | 02   | 06         | 08          | CEG306-5       | 16          |
| 6         | Hydraulic machines                                    | --   | 02         | 04          | CEG306-6       | 06          |
|           | <b>TOTAL</b>  | <b>16</b>                                    | <b>26</b>  | <b>38</b>   |                | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

### ASSESSMENT CRITERIA FOR PRACTICAL WORK.

#### i) Continuous Assessment of practical Work:

Every practical assignment shall be assessed for 25 marks as per following criteria :

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

#### ii) Progressive Skill Test :

One mid-term *Progressive Skill Test* of 25 marks shall be conducted marks awarded in oral mark sheet as per *Assessment Pro-forma III*.

## INSTRUCTIONAL STRATEGIES :

### Instructional Methods :

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .
5. **Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

### Teaching and Learning resources:

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

## REFERENCE MATERIAL :

### Books / Journals / IS Codes / Websites

| Reference Books: Sr No | AUTHOR                       | TITLE   | PUBLISHER                                    |
|------------------------|------------------------------|---|--|
| 1.                     | Dr.P.N.Modi& Dr.S.M.Seth     | Hydraulics & Fluids Mechanics                                   | Standard Book House, Dehli                   |
| 2.                     | S.Ramamrutham                | Hydraulics & Fluids Mechanics                                   | DhanpatRai& Sons, Delhi                      |
| 3.                     | R.S.Khurmi                   | A Text Book of Hydraulics, Fluids Mechanics Hydraulics Machines | S.Chand& Company Ltd. New Delhi              |
| 4.                     | R.K.Rajput                   | A Text Book of Fluids Mechanics Hydraulics Machines             | S.Chand& Company Ltd. New Delhi              |
| 5.                     | Dr.JagdishLal                | Fluids Mechanics Hydraulics                                     | Metropolitan Book Co. Private Ltd. New Delhi |
| 6.                     | S.K.Likhi                    | Hydarulics Laboratory Manual                                    | T.T.T.I. Chandhigrah                         |
| 7.                     | Panchanadikar and Dahiwadkar | Hydraulics  |  |
| 8.                     | Bansal                       | Hydraulics  |  |
| 9.                     | K. N. Rangaraju              | Flow through open channels                                      |  |

### b) Websites:

[www.icivilengineer.com](http://www.icivilengineer.com)

[www.efunda.com](http://www.efunda.com)

[www.efm.com](http://www.efm.com)

\* \* \*

**COURSE ID :**

**Course Name : MECHANICS OF STRUCTURES**

**Course Code : CEG307**

**Course Abbreviation : GMOS**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CCG110 Applied Mechanics**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                             | Total |
|-----------------------|---------------------------------------|---|---------------------------------|-----------------------------|-------|
|                       | Theory                                | Practical   | Theory Examination              | Oral Examination (Internal) |       |
| Details of Evaluation | Average of two tests of 20 marks each | 1. 25 marks for Continuous Assessment<br>2. 25 marks Progressive skill test<br>3. 25 marks for microproject | Term End Theory Exam (03 hours) | As per Proforma IV          |       |
| Marks                 | 20                                    | --  | 80                              | 50 I                        | 150   |

**RATIONALE:**

This course helps the students to understand different types of civil engineering structures and structural behavior of the members under different types of loading. The course includes study of basic structural actions and determination of stresses and deformations due to them. This course is a pre-requisite for Design of RCC and Steel Structures, Analysis of structures.

**COMPETENCY :**

Apply principles of structural mechanics to solve engineering problems as follows:

**Cognitive :**Understanding and applying principles of structural mechanics to engineering problems

**Psychomotor :**i) Operating testing machines ii) plotting graphs and diagrams

**Affective :**Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

**COURSE OUTCOMES :**

- CEG307-1** Enlist and classify structures as per structural actions
- CEG307-2** Solve problems on bodies under axial tension and compression
- CEG307-3** Solve problems on shear force and bending moments in beams
- CEG307-4** Determine moment of inertia of plane composite sections
- CEG307-5** Solve problems on bending and shear stresses in beams
- CEG307-6** Solve problems on strain energy

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | Programme Outcomes POs and PSOs         |                          |  |   |   |                            |                            |                         |                                      |                                  |
|---|---|--------------------------|--|---|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|   | PO 1<br>Basic and disciplined knowledge | PO 2<br>Problem analysis | PO 3<br>Design /development of solutions | PO 4<br>Engineering Tools/experimentation and testing | PO 5<br>The engineering practice for society,sustainability and environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of structural mechanics to solve engineering problems.. | 2                                       | 2                        | 2  | 1   | -   | -                          | 2                          | 1                       | -                                    | 1                                |
| <b>CEG307-1</b> Enlist and classify structures as per structural actions                    | 2                                       | 1                        | 1  | -   | -   | -                          | 2                          | 1                       | 2                                    | 1                                |
| <b>CEG307-2</b> Solve problems on bodies under axial tension and compression                | 2                                       | 2                        | 2  | 1   | -   | -                          | 2                          | 1                       | 2                                    | 1                                |
| <b>CEG307-3</b> Solve problems on shear force and bending moments in beams                  | 2                                       | 2                        | 2  | 1   | -   | -                          | 1                          | 2                       | 2                                    | 1                                |
| <b>CEG307-4</b> Determine moment of inertia of plane composite sections                     | 2                                       | 2                        | 2  | 1   | -   | -                          | 2                          | 1                       | 2                                    | 1                                |
| <b>CEG307-5</b> Solve problems on bending and shear stresses in beams                       | 2                                       | 2                        | 2  | 1   | -   | -                          | 2                          | 2                       | 2                                    | 2                                |
| <b>CEG307-6</b> Solve problems on strain energy   | 2                                       | 2                        | 1  | 1   | -   | -                          | 1                          | 1                       | 2                                    | 1                                |

**CONTENT:**

**A) Practical Work:**

Practical work shall consist of the following:

**a) Laboratory Experiments:**

*(Laboratory Manual on Mechanics of Structures developed by the Institute shall be used)*

| Sr.      | Laboratory experiments  | Competencies to be developed  | Course Outcome |
|----------|---|---|----------------|
| <b>A</b> | <b>Any Eight Experiments</b>  |   |                |
| 1        | Study the universal testing machine.  |   | CEG307-1       |
| 2        | Tension test on mild steel bar or HYSD steel bar  |   | CEG307-2       |
| 3        | Tension test on HYSD steel bar  |   |                |
| 4        | Compression test on metals  |   | CEG307-2       |
| 5        | Flexural test on mild steel   | 1. Study of mechanism of machines used for testing of construction material | CEG307-5       |
| 6        | Water absorption test on bricks   | 2. Study of properties of construction material.                            | CEG307-1       |
| 7        | Compressive test on bricks (dry and wet)  | 3. Motor skills in performing experiments.                                  | CEG307-2       |
| 8        | Flexural test on flooring tiles   | 4. Plotting and interpreting graphs.  | CEG307-5       |
| 9        | Flexural test on roofing tiles  | 5. Drawing real view diagrams of machine or apparatus.                      | CEG307-1       |
| 10       | Hardness test on metals   | 6. Self learning ability.   | CEG307-5       |
| 11       | Shear test on metals  | 7. Numerical and graphical data interpretation.                             | CEG307-1       |
| 12       | Impact test on metals   | 8. Managing time to complete experiment in given period                     |                |
| <b>B</b> | <b>Solve problems on each case</b>  |   |                |
| 1        | Shear force and bending moment for<br>1.cantilever,<br>2.simply supported beam,<br>3.overhanging beam                         |   | CEG307-3       |
| 2        | Moment of Inertia of a built section made of Angle section<br>1.Back to back on a gusset plate<br>2.Same side of gusset plate |   | CEG307-4       |

**b) Micro Projects: ( one microproject to the group of 4/5 students)**

1. Survey of Structures: By actually visit to various types of structures mentioned in the theory syllabus and prepare a report with their photographs.
2. Collect IS standards for methods of testing and specifications of machines/materials/specimens etc.
3. Collect information from industry for reinforcement steel available in market and prepare report.
4. Comparison of different types of reinforcement steel and to prepare report/chart
5. Comparison of different material for different properties of metals and to prepare report/chart
6. Collect photographs for different action of loading on different components of structures and to prepare report.
7. To prepare models of different types of beams and loading.
8. Any software-based exercises
9. Any other microprojects suggested by the teacher.

**B. INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure                     | Topic  |
|----|--------------------------------------|--|
| 1. | Field examples of course application | Topics of theory syllabus                    |
| 2. | Field examples of course application | Term-work assignment on survey of structures |

**Assessment Criteria for Term End Oral Examination**

At least two questions, based on term work produced by the candidate, each of knowledge level, comprehension and application level shall be asked by the examiner during the oral examination.

**C) THEORY**

**Section I**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|----------|--|------------------|---------------------------|
| <b>1</b> | <p><b>CEG307-1</b> Enlist and classify structures as per structural actions</p> <p><b>Introduction to Structural Analysis</b></p> <p>1.1 Definition of an engineering structure</p> <p>1.2 Basic requirements of a structure : safety, serviceability, durability, economy, aesthetics, practicality</p> <p>1.3 Types of structures and their functions : Buildings, trestles, masts, piers, bridges, aqueducts, pipes, siphons, conduits, tunnels, chimneys, shell roofs, domes, retaining walls, dams, water tanks, silos, bunkers (labeled diagrams of these structures). Structural and non-structural components</p> <p>1.4 Types of structural systems : Discrete system, continuum system, combined system. Field examples</p> <p>1.5 Definition of structural analysis and structural design</p> <p>1.6 Basic structural actions : i) axial tension, ii) axial compression, iii)</p> | <b>04</b>        | <b>08</b>                 |



| Sr. No. | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---------|---|------------------|---------------------------|
|         | <p>flexure, iv) shear, v) torsion. Combination of basic structural actions. Example of simple pressing machine (Ref. Book No.1).Simple field examples of each structural action</p> <p>1.7 Types of structural connections : i) Pinned or hinged or simple connection ii) rigid connection</p> <p>1.8 Static determinacy of a structure</p> <p>1.9 Types of structural materials and their suitability: i) concrete ii) steel iii) reinforced concrete iv) pre-stressed concrete</p>  |                  |                           |
| 2       | <p><b>CEG307-2</b> Solve problems on bodies under axial tension and compression</p> <p><b>Axial Tension and Compression</b></p> <p>2.1 Definition of axial and eccentric loading. Definition of uni-axial, bi-axial and tri-axial loading. Diagrams showing these loadings.</p> <p>2.2 Field examples of members in axial tension and compression</p> <p>2.3 Hooke's law. Young's modulus of elasticity. Behavior of ductile and brittle material under axial tension. Load-elongation graph.</p> <p>2.4 Numerical problems on elongation of uni-axial members made up of i) single material ii) combination of two or more materials along the length (compound members)</p> <p>2.5 Composite sections : Stresses and elongation under uni-axial loading. Modular ratio.</p> <p>2.6 Lateral strains and deformation. Poisson's ratio</p> <p>2.7 Bi-axial and tri-axial loading. Volumetric stress and strain, bulk modulus.</p> <p>2.8 Temperature stresses in simple members</p> <p>2.9 Shear stresses and shear strains. Modulus of rigidity</p> <p>2.9 Relation among elastic constants</p> | 10               | 16                        |

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| 3   | <p><b>CEG307-3</b> Solve problems on shear force and bending moments in beams</p> <p><b>Shear Forces and Bending Moments in Beams</b></p> <p>3.1 Types of beams: simply supported, over-hanging, cantilever, propped cantilever, fixed, continuous. Types of loads: concentrated loads, uniformly distributed loads and uniformly varying loads, couple loads</p> <p>3.2 Definition of shear force and bending moment at a section of beam. Sign convention. Relation between shear force and bending moment</p> <p>3.3 Shear force diagrams and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to above loads. Point of contra flexure.</p> | 10               | 16                        |
|   | <b>Total</b>   | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                           |

## Section II

| Sr. No. | Topics   | Teaching Hours | Theory Evaluation (Marks) |
|---------|--|----------------|---------------------------|
| 4       | <p><b>CEG307-4</b> Determine moment of inertia of plane composite sections</p> <p><b>Moment of Inertia</b></p> <p>4.1 Definition of moment of inertia. Moment of inertia of regular plane figures square rectangle triangle circle</p> <p>4.2 Parallel axes theorem and perpendicular axes theorem</p> <p>4.3 Moment of Inertia of composite figures. Radius of gyration</p> | 08             | 12                        |

|   |  |           |           |
|---|--|-----------|-----------|
| <b>5</b>  | <b>CEG307-5</b> Solve problems on bending and shear stresses in beams  |           |           |
|   | <p><b>Stresses in Beams</b></p> <p><b>5.1 Bending Stresses in Beams</b><br/>Flexural behavior of beams. Pure bending. Assumptions in theory of simple bending. Flexural formula. Stress distribution over the section, moment of resistance section modulus. Numerical problems on symmetrical/ unsymmetrical sections</p> <p><b>5.2 Shear Stresses in Beams</b><br/>Assumptions and shear stress formula (no derivation).<br/>Shear stress distribution across different cross-sections of beam e.g. rectangular, circular, I section, T section.<br/>Relation between maximum and average shear stress</p> | <b>06</b> | <b>10</b> |
| <b>6</b>  | <b>CEG307-6</b> Solve problems on strain energy  |           |           |
|   | Definition of strain energy, resilience, proof resilience and modulus of resilience. Strain energy stored and stresses developed due to gradual, sudden and impact loading.  | <b>04</b> | <b>08</b> |
| <b>Total</b>  |  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Topic no. | Name of topic                             | Distribution of Marks (Cognitive level wise) |               |             | Total Marks |
|-----------|---|--|---------------|-------------|-------------|
|           |   | Remember                                     | Understanding | Application |             |
| 1         | Introduction to Structural Analysis       | 02   | 02            | 04          | <b>08</b>   |
| 2         | Axial Tension and Axial Compression       | 02   | 04            | 10          | <b>16</b>   |
| 3         | Shear Forces and Bending Moments in Beams | 02   | 04            | 10          | <b>16</b>   |
| 4         | Moment of Inertia                         | 02   | 04            | 06          | <b>12</b>   |
| 5         | Stresses in Beams                         | 02   | 06            | 12          | <b>20</b>   |
| 6         | Strain Energy                             | 02   | 02            | 04          | <b>08</b>   |
|           | <b>Total</b>                              | <b>12</b>                                    | <b>22</b>     | <b>46</b>   | <b>80</b>   |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above. Candidates can attempt questions of the above allotted marks only.

## INSTRUCTIONAL STRATEGIES:

### Instructional Methods :

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .
5. **Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.
6. Tutorial exercises

### Teaching and Learning resources:

1. Chalk board
2. Use of charts
3. Audio visual presentations
4. Question Bank

## REFERENCE MATERIAL

### a) Books / Journals / IS Codes

| Sr. No. | Author                           | Title                                | Publisher  |
|---------|----------------------------------|--------------------------------------|--|
| 1.      | Timoshenko, S.P. and Young, D.H. | Elements of Strength of Materials    | Affiliated East West Press Pvt. Ltd., Delhi      |
| 2.      | Sunil Deo                        | Text book on Mechanics of Structures | Nirali Publications                              |
| 3.      | Bhavikatti, S.S.                 | Strength of Materials                | Vikas Publication House Pvt. Ltd., Noida,        |
| 4.      | Khurmi, R.S.                     | Strength of Materials                | S.Chand& Co., Delhi                              |
| 5.      | Singer, F.L.                     | Strength of Materials                | Harpe Collins Publishers India Delhi             |
| 6.      | S.Ramamurtham and R.Narayanan    | Strength of Materials                | Dhanpat Rai Publication Co. Pvt. Ltd., New Delhi |
| 7       | Rattan S.S                       | Strength of Material                 | Mc Graw Hill Education, New Delhi                |
| 8       | Punamia B.C.                     | Strength of Material                 | Laxmi Publication (p)Ltd. New Delhi              |

**b) Websites**

- i. [en.wikipedia.org/wiki/Structural\\_mechanics](https://en.wikipedia.org/wiki/Structural_mechanics)
- ii. [http://www.powershow.com/view/15b5baNzRmY/CE\\_203Structural\\_Mechanics\\_powerpoint\\_ppt\\_presentation](http://www.powershow.com/view/15b5baNzRmY/CE_203Structural_Mechanics_powerpoint_ppt_presentation)

\* \* \*

**COURSE ID :**

**Course Name : SURVEYING - I**  
**Course Code : CEG308**  
**Course Abbreviation : GSVI**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : NIL**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 07      |
| Practical        | 04           |         |

**Note: for practicals number of students in a batch shall be 10.**

**Evaluation Scheme:**

| Mode of Evaluation           | Progressive Assessment                                     |  | Term End Examination |                     |            |
|------------------------------|--|--|----------------------|---------------------|------------|
|                              | Theory   | Practical                              | Theory               | Practical/ Oral**   | Total      |
| <b>Details of Evaluation</b> | Average of Two tests of 20marks each(1 hour duration each) | One Progressive Skill Test of 25 marks | One paper (3 hours)  | As per Proforma III |            |
| <b>Marks</b>                 | <b>20</b>  | <b>--</b>                              | <b>80</b>            | <b>75 E</b>         | <b>175</b> |

\*\* (To be assessed by internal and external examiner as per **proformalll**)

**RATIONALE:**

Surveying is the core Civil Engg. subject. The first stage of every construction project is to survey the area, collect the data, analyze and then prepare the drawings. Because of this, it is the basic requirement of every civil engineer to be well equipped with knowledge and skills of surveying.

The subject involves teaching basic principles, concepts & procedures in surveying and levelling. With this knowledge and skill, civil engineer will be able to select proper equipment and method of surveying depending upon the requirement to execute the survey work for different civil engineering projects such as building construction, transportation engineering , Irrigation engineering , environmental engineering etc. It also enables him to carry out his duties while working as site- in-charge of any construction project.

**COMPETENCY**

Apply principles of surveying to solve engineering problems as follows.

**Cognitive: Understanding** and applying principles of Surveying to engineering problems.

**Psychomotor: i)** Measurement of distance and angle **ii)** Setup the compass **iii)** Setting up level

**Affective :**Attitude of **i)** Calculative aspect **ii)** accuracy **iii)** safety **vi)** civic sense

**COURSE OUTCOMES:**

- CEG308-1** State the importance of survey &  
Determine distances with various linear instruments.
- CEG308-2** Calculation of area.
- CEG308-3** Determine the various types of bearings.
- CEG308-4** Determine reduced levels by different methods.
- CEG308-5** Draw contour by interpolation & other methods.
- CEG308-6** Determine area by polar and digital planimeter.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
|---|---|--------------------------|---|--|--|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
| <b>Competency:</b><br>Apply principles of surveying-1 to solve engineering problems                     | 3   | 3                        | 2                                       | 2  | 1  | 1                          | 1                          | 1                       | 1                                    | 1                                |
| <b>CEG308-1</b> State the importance of survey.<br>Determine distances with various linear instruments. | 3   | 3                        | 2                                       | 2  | 2  | 1                          | 2                          | 1                       | 2                                    | 2                                |
| <b>CEG308-2</b><br>Calculation of area.   | 3   | 3                        | 2                                       | 2  | 1  | 1                          | 1                          | 1                       | 1                                    | 3                                |
| <b>CEG308-3</b><br>Determine the various types of bearings.   | 3   | 3                        | 2                                       | 2  | 1  | 1                          | 1                          | 1                       | 2                                    | 3                                |
| <b>CEG308-4</b><br>Determine reduced levels by different methods.                                       | 3   | 3                        | 2                                       | 2  | 2  | 1                          | 1                          | 2                       | 2                                    | 2                                |
| <b>CEG308-5</b><br>Draw contour by interpolation & other methods  | 3   | 3                        | 2                                       | 2  | 1  | 2                          | 1                          | 2                       | 2                                    | 2                                |
| <b>CEG308-6</b><br>Determine area by polar and digital planimeter                                       | 3   | 3                        | 2                                       | 2  | 2  | 1                          | 1                          | 1                       | 2                                    | 2                                |

**PRACTICALS :**

**List of practicals : Following practicals should be performed :**

| Sno | Title of Practical Exercise  | Skills / Competencies to be developed  | Course Outcome |
|-----|--|--|----------------|
| 1   | Study & use of chain, (20m, 30m) Metallic & steel tapes, Ranging rods, pegs and arrows.  | Determine distances with various instruments                                 | CEG308-1       |
| 2   | Direct & indirect ranging, study and use of line ranger. Measurement of distances with chain and tape.   | Trace the straight line for measuring distance with various instruments      | CEG308-1       |
| 3   | Study & use of open cross staff & optical square, measurement of area of five sided traverse by chain and cross staff survey.  | Setting the perpendicular and oblique offset and calculate area              | CEG308-2       |
| 4   | Running a survey line to locate adjacent objects such as building, road, trees, electric poles etc, by taking offsets with open cross staff / optical square. Booking field notes. | Locate all details included and determine the area                           | CEG308-2       |
| 5   | Study & use of Prismatic compass – components, their functions, adjustments, Observing fore bearings and back bearings of lines, calculation of included angles.                   | Determine the included angles between two survey lines                       | CEG308-3       |
| 6   | Observing fore bearings and back bearings of a 5 sided closed traverse, identifying the stations affected by local attraction and calculation of corrected bearings.               | Determine the angles included between two survey lines and apply corrections | CEG308-3       |
| 7   | Study & use of Dumpy level, components, temporary adjustments, study of leveling staff.  | Handle dumpy level and go for temporary adjustment                           | CEG308-4       |
| 8   | Carrying out differential levelling, recording the readings in a level field book. Calculation of Reduced Levels, (H.I. Method), applying arithmetic check.                        | Determine the vertical distance between points                               | CEG308-4       |
| 9   | Carrying out differential leveling, Calculation of reduced Levels, (rise and fall method), applying arithmetic check.  | Determine the vertical distance between points                               | CEG308-4       |
| 10  | Fly leveling – carrying bench mark from one point to another point.  | Carrying BM from distant points  | CEG308-4       |
| 11  | Study and use of auto level - , temporary adjustments, taking staff readings.  | Handle Auto- level   | CEG308-4       |
| 12  | Contouring by direct method / Indirect Method  | Prepare contour plans  | CEG308-5       |
| 13  | Measurement of area of irregular figure by polar planimeter  | Measure area.  | CEG308-6       |
| 14  | Measurement of area of irregular figure by Digital planimeter.   | Measure area   | CEG308-6       |



## PROJECTS

| SNo | List of projects  | Skills / Competencies to be developed                                       | Course Outcome |
|-----|---|---|----------------|
| 1   | Chain & compass traverse survey- a closed traverse of minimum 5 sides enclosing a building ,calculation of included angles and corrected bearings, locating details and plotting on A1 size imperial drawing sheet.   | Locate all details included and d plot the traverse                         | CEG308 - 3     |
| 2   | Profile leveling & cross-sectioning - Running a base line 300 m. length with cross section at every 30m. Length of cross section may be 20m on either side with staff readings at 10 m interval. Spot levels should be taken at every 10m along the base line. Plotting of L-section and minimum of 3 cross-sections on A1 size imperial drawing sheet. | Determine nature of ground along longitudinal and cross sections            | CEG308 - 4     |
| 3   | Block contouring – A block of 100m * 100m with spot levels at 10m * 10m , plotting the contours with suitable contour interval by interpolation on A1 size imperial drawing sheet   | Preparing contour plan& identifying the characteristics on the plan/ground. | CEG308 -5      |

### Suggested Micro-Projects:

1. Collect the technical & commercial information of advanced instruments used for measurement of distances.
2. Collect the technical & commercial information of various instruments used for measurement of bearings.(with specifications)
3. Collect the technical & commercial information of various instruments used for setting up perpendiculars.
4. Collect the technical & commercial information of various instruments used for levelling.(with specifications)
5. Measuring the distance between any two points using different instruments & comparing the results.
6. Measurement of area of a plot with cross staff survey.
7. Divide a plot into 3 to 4 parts of equal area.
8. Measuring bearings of sides of a traverse& making corrections to the measured bearings.
9. Setting up permanent B.M. in the Institute campus w.r.t. the nearby permanent B.M. set up by PWD.
10. Determine the R.L.s of various points in the campus w.r.t. the permanent B.M.
11. Measure the area of irregular figure by Polar & Digital Planimeter & compare the accuracy of results.

**Note:** **Group of 3-4 students should be made.**  
**Similar assignments should be given as micro-projects.**

**Continuous assessment;**

Practical document shall consist of record of all practicals and projects in field book and drawings (3 Nos) of project work on A1 size imperial drawing sheet.

**ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION**

**Assessment Criteria for Practical :**

**i) Continuous Assessment of Practical**

Every practical assignment shall be assessed for 25 marks as per following criteria :

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted.

**J) Practicaal/Oral examination shall be conducted based on the Practical& projects done by the students & shall be assessed by both Internal & External Examiners as per proforma-III.**

**CONTENT : THEORY**

**Section – I**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>Course Outcome- CEG308-1</b> State the importance of survey. |   |                  |                           |
| <b>1</b>  | <b>Introduction To Surveying/Linear Measurements</b><br>1.1 Definition of surveying<br>1.2 Object of surveying<br>1.3 Classification of surveying.- primary and secondary classification based on different parameters<br>1.4 Principles of Surveying<br>1.5 Uses of surveying. | <b>08</b>        | <b>12</b>                 |

|  |  |           |           |
|--|--|-----------|-----------|
|  | <p><b>Linear Measurements</b><br/>         1.6 Linear measurement<br/>         1.7 Study of metric chain – 20m &amp; 30m, it's components<br/>         1.8 Study of tape – types of tape – linen ,metallic, steel &amp; Invar<br/>         1.9 Instruments for marking stations- Pegs, Arrows, Ranging rods.<br/>         1.10 Ranging- meaning, code of signals, types of ranging, procedure of each type<br/>         1.11 Chaining – Chaining on plain and sloping ground,<br/>         1.12 Errors in chaining, - Errors due to incorrect length of chain, Correction in length &amp; area</p>   |           |           |
| <i>Course Outcome-CEG308-2</i> Calculation of area.  |  |           |           |
| <b>2</b>   | <p><b>Chain and cross staff Survey</b><br/>         2.1 Chain triangulation, definition of survey stations , base line, check line, tie line , well and ill conditioned triangle , Selection of survey stations,<br/>         2.2 Offsets - Perpendicular &amp; Oblique offsets. Instruments used for setting out right angles - Open cross staff, Optical square.<br/>         2.3 Chain and Cross staff survey, calculation of area from recorded observations.<br/>         2.4 Obstacles in chaining, methods to overcome the obstacles.<br/>         2.5 Conventional signs on survey maps for – cutting, embankment, marshy land, road, railway, river, bridge, tunnel, fencing, transmission line, cultivated land, orchard, places of worship.</p>   | <b>08</b> | <b>12</b> |
| <i>Course Outcome -CEG308-3</i> Determine the various types of bearings.   |  |           |           |
| <b>3</b>   | <p><b>Chain and Compass Survey</b><br/>         3.1 Prismatic compass – Principle, components, construction and use.<br/>         3.2 Bearing of a line- True meridian, magnetic meridian and arbitrary meridian, whole circle &amp; quadrantal system, reduced bearings, fore bearing and back bearing, conversion of bearings, calculation of included angles from bearings.<br/>         3.3 Local attraction- errors due to local attraction, precautions to be taken to avoid local attraction, correction of bearings affected by local attraction, numerical problems, magnetic declination, dip of the needle.<br/>         3.4 Traversing with chain and compass, open &amp; closed traverse, plotting the traverse, by parallel meridians through each station and by included angle methods, closing error, graphical adjustment of closing error by Bowditch's rule.</p> | <b>10</b> | <b>16</b> |
|  | <i>Total</i>   | <b>26</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |  |           |           |

**Section II**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <i>Course Outcome - CEG308-4</i> Determine reduced levels by different methods.   |   |                  |                           |
| 4   | <p><b>Levelling</b></p> <p>4.1 Definitions - Level surface , Horizontal line, vertical line, datum surface, reduced level, Bench mark and its types.-GTS, Permanent, arbitrary and temporary.</p> <p>4.2 Dumpy Level – Components, Temporary adjustments of level, line of collimation. Axis of bubble tube, fore sight, Back sight, Intermediate sight. Change Point, Height of collimation, fundamental axes and their relationship.</p> <p>4.3 Study and use of Auto level.</p> <p>4.4 Leveling staff - Telescopic and folding type.</p> <p>4.5 Calculation of reduced levels, arithmetic check, examples by plane of collimation method and rise &amp; fall method, computation of missing readings, obstacles in leveling, numerical problems.</p> <p>4.6 Classification of Leveling – Simple leveling, differential leveling, fly leveling, profile leveling and cross - sectioning, check leveling,</p> <p>4.7 Sources of errors in leveling- list of errors, precautions to be taken to eliminate the same.</p> | 15               | 24                        |
| <i>Course Outcome - CEG308-5</i> Draw contour by interpolation & other methods.   |   |                  |                           |
| 5   | <p><b>Contouring</b></p> <p>5.1 Definitions - contour, contour interval, horizontal equivalent.</p> <p>5.2 Characteristics of contour lines.</p> <p>5.3 Uses of contour map,</p> <p>5.4 Methods of Contouring– Direct and Indirect method of locating contours,</p> <p>5.5 Interpolation of contours- Approximate, Arithmetic &amp; Graphical. Study of Topo sheets.</p>  | 04               | 10                        |
| <i>Course Outcome - CEG308-6</i> Determine area by polar and digital planimeter.  |   |                  |                           |
| 6   | <p><b>Minor Instruments</b></p> <p>6.1 Polar Planimeter - Construction and use, Numerical problems on calculation of area.</p> <p>6.2 Digital planimeter , Study and use. Measurement of capacity of Reservoir.</p>   | 03               | 06                        |
| <b>Total</b>  |   | <b>22</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |

**Specification table for setting question paper for semester end theory examination :**

| Topic No. | Name of topic                                     | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---|--|------------|-------------|----------------|-------------|
|           |   | Remember                                     | Understand | Application |                |             |
| 1         | Introduction To Surveying.<br>Linear Measurements | 04   | 04         | 04          | CEG308 - 1     | 12          |
| 2         | Chain and cross staff Survey                      | 02   | 06         | 04          | CEG308 - 2     | 12          |
| 3         | Chain and Compass Survey                          | 04   | 04         | 08          | CEG308 - 3     | 16          |
| 4         | Levelling   | 04   | 08         | 12          | CEG308 - 4     | 24          |
| 5         | Contouring  | 02   | 04         | 04          | CEG308 - 5     | 10          |
| 6         | Minor Instruments                                 | 02   | 02         | 02          | CEG308 - 6     | 06          |
| TOTAL     |   | 18   | 28         | 34          |                | 80          |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**INSTRUCTIONAL STRATEGIES :**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .

**Suggested Micro-projects:**

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL :**

**Books / Journals / IS Codes / Websites**

| <b>Reference Books:<br/>Sr No</b> | <b>AUTHOR</b>                        | <b>TITLE</b>                   | <b>PUBLISHER</b>                          |
|-----------------------------------|--------------------------------------|--------------------------------|---|
| <b>1.</b>                         | Surveying & Leveling –<br>vol- 1 & 2 | T.P.Kanetkar& S.V.<br>Kulkarni | Pune<br>vidyarthiGrihaprakashan ,<br>Pune |
| <b>2.</b>                         | Surveying & Leveling –<br>vol- 1 & 2 | Dr. B.C. Punmia                | Laxmi Publications, New<br>Delhi.         |
| <b>3.</b>                         | Surveying & Leveling                 | N.N. Basak                     | Tata McGraw Hill                          |
| <b>4.</b>                         | Surveying & Leveling –<br>vol- 1 & 2 | S.K. Duggal ,                  | Tata McGraw Hill                          |
| <b>5.</b>                         | Text book of surveying               | S.K. Husain, M.S. Nagaraj      | S.Chand& Co.                              |
| <b>6.</b>                         | Surveying & Leveling –<br>vol- 1 & 2 | T.P.Kanetkar& S.V.<br>Kulkarni | PunevidyarthiGrihaprakashan ,<br>Pune     |

\* \* \*

**COURSE ID :**

**Course Name : SURVEYING II**  
**Course Code : CEG309**  
**Course Abbreviation : GSV2**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : GSV1 (CEG308)**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 07      |
| Practical        | 04           |         |

**Note : for practicals number of students in a batch shall be 10.**

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                          |  | Term End Examination |                       | Total      |
|-----------------------|---|--|----------------------|-----------------------|------------|
|                       | Theory  | Practical                              | Theory               | Practical Examination |            |
| Details of Evaluation | Two tests of 20marks each(1 hour duration each) | One Progressive Skill Test of 25 marks | One paper (3 hours)  | As per Proforma-III   |            |
| Marks                 | <b>20 each</b>                                  | ---                                    | <b>80</b>            | <b>75 E</b>           | <b>175</b> |

\*\* (To be assessed by internal and external examiner as per **proforma III**)

**Under continuous assessment, out of 25 marks, 5 marks shall be allotted for microproject.**

**RATIONALE :**

Surveying is the core Civil Engg. Subject. The first stage of every construction project is to survey the area, collect the data, analyze and then prepare the drawings. Because of this, it is the basic requirement of every civil engineer to be well equipped with knowledge and skills of surveying.

The subject involves teaching basic principles, concepts & procedures in surveying and levelling. With this knowledge and skill, civil engineer will be able to select proper equipment and method of surveying depending upon the requirement to execute the survey work for different civil engineering projects such as building construction, transportation engineering, Irrigation engineering, environmental engineering etc. It also enables him to carry out his duties while working as site-in-charge of any construction project.

**COMPETENCY**

Apply principles of Surveying to solve engineering problems as follows.

**Cognitive :**Understanding and applying principles of Surveying to engineering problems.

**Psychomotor :**i) Measurement of distance and angle ii) Setup the Theodolite tachometer & plane table Digital theodolite & Total station. iii) Setingup level iv) setting the curve.

**Affective :**Attitude of i) Calculative aspect ii) accuracy iii) safety vi) civic sense

**COURSE OUTCOMES :**

- CEG309-1** Measurement of horizontal and vertical angles by theodolite.  
**CEG309-2** Measurement of horizontal and vertical distance by tachometer.  
**CEG309-3** Setting up plane table and finding out area and distance.  
**CEG309-4** Setting of curves by different methods.  
**CEG309-5** Find out levels by digital theodolite and total station.  
**CEG309-6** State the concept of Remote sensing & GPS.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|---|---|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b><br>Apply principles of surveying-2 to solve engineering problems | 3   | 3                     | 2                                    | 2   | 1   | 1                       | 1                       | 1                    | 1                                 | 1                             |
| <b>CEG309-1</b><br>Measurement of horizontal and vertical angles by theodolite..    | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 1                       | 1                    | 2                                 | 1                             |
| <b>CEG309-2</b><br>Measurement of horizontal and vertical distance by tachometer.   | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 1                       | 1                    | 2                                 | 1                             |
| <b>CEG309-3</b><br>Setting up plane table and finding out area and distance.        | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 1                       | 1                    | 2                                 | 1                             |
| <b>CEG309-4</b><br>Setting of curves by different methods.                          | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 1                       | 1                    | 2                                 | 1                             |
| <b>CEG309-5</b><br>Find out levels by digital theodolite and total station.         | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 2                       | 1                    | 2                                 | 2                             |
| <b>CEG309-6</b><br>State the concept of Remote sensing & GPS                        | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 1                       | 1                    | 2                                 | 2                             |



**LIST OF PRACTICALS (any 14) & PROJECTS:**

| Sno | Title of Practical Exercise  | Skills / Competencies to be developed      | Course Outcome |
|-----|--|--|----------------|
| 1   | Transit Theodolite - Components and their functions, - performing temporary adjustments, reading the vernier                 | Setup the theodolite                       | CEG309 -1      |
| 2   | Measurement of horizontal angle by ordinary method & Repetition method.  | Measurement of horizontal angle            | CEG309 - 1     |
| 3   | Measurement of vertical angle using Theodolite.  | Measurement of Vertical angle              | CEG309 - 1     |
| 4   | Measurement of magnetic bearing of a line using theodolite.  | Measurement of bearing                     | CEG309 - 1     |
| 5   | Measurement of deflection angle by taking open traverse of 4 - 5 sides.  | Measurement of Deflection angle            | CEG309 - 1     |
| 6   | Prolonging and ranging line using theodolite.  | Ranging a line                             | CEG309 - 1     |
| 7   | To find reduced levels and horizontal distances using theodolite as a tachometer.  | Find RL& distance                          | CEG309 - 2     |
| 8   | To find constants of a given tachometer  | Find constants of tacheometer              | CEG309 -2      |
| 9   | Study and use of plane table & its accessories, temporary adjustments of plane table. Locating points by method of radiation | Setting up plane table                     | CEG309 - 3     |
| 10  | Locating details by the method of intersection . Orientation of plane table by back sighting                                 | Locating details                           | CEG309 -3      |
| 11  | Setting out simple circular curve by offsets from long chord.  | Setting out curves                         | CEG309 - 4     |
| 12  | Setting out simple circular curve by Rankine's method of deflection angle.   | Setting out curves                         | CEG309 - 4     |
| 13  | Study and use of digital theodolite/ EDM.( Demo)   | Find the levels using digital theodolite   | CEG309 - 5     |
| 14  | Use total station for measuring horizontal angle, vertical angle, horizontal distance, sloping distance, vertical            | Measure distance & angles by total station | CEG309 – 5     |
| 15  | Demonstration of GPS, Locating co-ordinates of a point.  | Concept of GPS                             | CEG309 – 6     |

**Projects**

| SNo | List of projects   | Skills / Competencies to be developed  | Course Outcome |
|-----|--|--|----------------|
| 1   | 1. Theodolite traverse survey for a closed traverse 5-6 sides for a small area., computation by Gale's traverse table, plotting the traverse with details on A1 size imperial drawing sheet. | Plotting the traverse using theodolite | CEG309 - 1     |

|          |  |   |               |
|----------|--|---|---------------|
| <b>2</b> | 2. Plane table traversing – running a minimum 5 sided traverse enclosing a building using method of traversing. Locating details of buildings, poles, etc. by radiation & intersection method. plotting the traverse with details on A1 size imperial drawing sheet. | Plotting the traverse using Plane table | CEG309 -<br>3 |
|----------|--|---|---------------|

**Suggested Micro-Projects:**

1. Collect the technical & commercial information of advanced theodolites ( 1’’ micro-optic theodolite, EDM) with specifications.
2. Collect the technical & commercial information of Total station GPS of different make & brands.(with specifications)
3. Prepare contour map of small area using Total station.
4. Setting a curve in the college campus.
5. Determine the R.L.s of different buildings in the campus using Tachometer & Total station & comparing the results.
6. Collect information of Drone survey.
7. Collect information of GPS & GIS applications.

**Note:** Atleast one micro-project shall be done by each group.  
Group of 3-4 students shall be made.  
Similar assignments shall be given as micro-projects.

**Continuous Assessment:**

Practical document shall consist of record of all practicals& projects in field book & drawings (02nos) of project work on A1 size imperial drawing sheet.

**Under continuous assessment, out of 25 marks, 5 marks shall be allotted for microproject.**

**ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION**

**A) Assessment Criteria :**

**i) Continuous Assessment of Practicals.**

Every practical assignment shall be assessed for 25 marks as per following criteria:

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted.

**A) Pactical/Oral examination shall be conducted based on the Practicals & projects done by the students & shall be assessed by both Internal & External Examiners as per proforma-III**

**CONTENT : THEORY**

**Section – I**

| Sr. No.  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|--|---|------------------|---------------------------|
| <b>Course Outcome- CEG309-1</b> Measurement of horizontal and vertical angles by theodolite.   |   |                  |                           |
| <b>1</b>   | <b>Theodolite Survey</b><br>1.1 Types of transit theodolite and their functions, technical terms used in theodolite surveying - swinging the telescope, transiting, changing the face. Temporary adjustments of Theodolite. Fundamental axes and their desired relationship<br>1.2 Measurement of horizontal angle by ordinary & repetition method, Errors eliminated by method of repetition<br>1.3 Measurement of vertical angle, Measurement of deflection angle, measurement of magnetic bearing of a line, Prolonging a straight line<br>1.4 Theodolite traversing - method of included angles, checks in closed traverse, calculation of bearings from angles.<br>1.5 Consecutive co-ordinates, latitude, departure, independent co-ordinates, error of closure.<br>1.6 Distribution of angular error, adjustment of bearings, balancing the traverse, Bowditch's rule & transit rule, Gale's traverse table, sources of errors in theodolite survey, | <b>16</b>        | <b>28</b>                 |
| <b>Course Outcome- CEG309-2</b> Measurement of horizontal and vertical distance by tachometer.   |   |                  |                           |
| <b>2</b>   | <b>Tachometric Survey</b><br>2.1 Principle of tachometric survey, methods of tacheometry, use of analytic lens (no derivation), use of theodolite as a tachometer by fixed hair system with staff held vertical.(no derivation)<br>2.2 Determination of tachometric constants, errors in tachometric surveying, simple numerical problems on above topic.<br>2.3 Determination of horizontal & vertical distances with Tacheometer by Fixed hair method & staff held vertical.  | <b>08</b>        | <b>12</b>                 |
|  | <i>Total</i>  | <b>24</b>        | <b>40</b>                 |
| (Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |   |                  |                           |

**Section II**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>Course Outcome - CEG309-3</b> Setting up plane table and finding out area and distance. |  |                  |                           |
| <b>3</b>   | <b>Plane Table Survey</b><br><br>3.1 Principles of plane table survey, accessories used in plane table survey,<br>3.2 Setting up of plane table – centering, levelling, orientation by magnetic needle and back sighting.<br>3.3 Methods of plane table surveying- radiation, intersection & Traversing.<br>3.4 Merits & demerits of plane table surveying, situations where plane table survey is preferred.  | <b>06</b>        | <b>12</b>                 |
| <b>Course Outcome - CEG309-4</b> Setting of curves by different methods.                   |  |                  |                           |
| <b>4</b>   | <b>Simple Curves</b><br><br>4.1 Types of curves used in road and railway alignments.<br>4.2 Notations of a simple circular curve,<br>4.3 Method of curve setting - offset from long chord & Rankine's method of tangential angles. Simple Numerical problems on above topic.   | <b>06</b>        | <b>12</b>                 |
| <b>Course Outcome - CEG309-5</b> Find out levels by digital theodolite and total station.  |  |                  |                           |
| <b>5</b>   | <b>Advanced survey equipments.</b><br><br>5.1 Component parts and procedure to set and use digital theodolite for measurement of horizontal and vertical angle,<br>5.2 Component parts and procedure to set and use digital level or finding and recording reduced level.<br>5.3 Component parts of total station, use of function keys, set up of total station, setting a back sight, measurement with total station, general setting required for all stations, Horizontal angles, Vertical angles, Distances & Co-ordinates. field book recording, radial shooting, survey station description by codes, instrument station entry, data retrieval etc. | <b>08</b>        | <b>10</b>                 |
| <b>Course Outcome - CEG309-6</b> State the concept of Remote sensing & GPS.                |  |                  |                           |

|   |   |           |           |
|---|---|-----------|-----------|
| <b>6</b>  | <b>Remote sensing</b><br>6.1 Definition of remote sensing, Concept of remote sensing,<br>6.2 Types of remote sensing system-Passive system, Active system,<br>6.3 Distance of remote sensing, Remote sensing data, Remote sensing process, Application of remote sensing, Advantages of remote sensing, Limitations of remote sensing,<br>6.4 GPS- introduction and use | <b>04</b> | <b>06</b> |
|   | <b>Total</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

**Specification table for setting question paper for semester end theory examination :**

| Topic No. | Name of topic               | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|-----------------------------|--|------------|-------------|----------------|-------------|
|           |                             | Remember                                     | Understand | Application |                |             |
| 1         | Theodolite Survey           | 08   | 08         | 12          | CEG-309-1      | 28          |
| 2         | Tachometric Survey          | 02   | 04         | 06          | CEG-309-2      | 12          |
| 3         | Plane Table Survey          | 04   | 08         | --          | CEG-309-3      | 12          |
| 4         | Simple Curves               | 04   | 04         | 04          | CEG-309-4      | 12          |
| 5         | Advanced survey equipments. | 04   | 06         | -           | CEG-309-5      | 10          |
| 6         | Remote sensing              | 02   | 04         | -           | CEG-309-6      | 06          |
| TOTAL     |                             | 24   | 34         | 22          |                | 80          |

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.

4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .

### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

### Teaching and Learning resources :

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

### REFERENCE MATERIAL:

#### Books / Journals / IS Codes / Websites/ Reference Books

| Sr No | AUTHOR                         | TITLE                              | PUBLISHER                                 |
|-------|--------------------------------|------------------------------------|---|
| 1.    | T.P.Kanetkar&<br>S.V. Kulkarni | Surveying & Levelling – vol- 1 & 2 | Pune<br>vidyarthiGrihaprakashan ,<br>Pune |
| 2.    | Dr. B.C. Punmia                | Surveying & Levelling – vol- 1 & 2 | Laxmi Publications, New<br>Delhi.         |
| 3.    | N.N. Basak                     | Surveying & Levelling              | Tata McGraw Hill                          |
| 4.    | S.K. Duggal ,                  | Surveying & Levelling – vol- 1 & 2 | Tata McGraw Hill                          |
| 5.    | SatheeshGopi&<br>others        | Advanced Surveying                 | Pearson                                   |

**COURSE ID :**

**Course Name : Transportation Engineering.**  
**Course Code : CEG310**  
**Course Abbreviation : FTRE**

**TEACHING AND EVALUATION SCHEME:**

Pre-requisite Course(s) : Nil

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 4            | 6       |
| Practical        | 2            |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |                        | Term End Examination            |                    | Total      |
|-----------------------|---------------------------------------|------------------------|---------------------------------|--------------------|------------|
|                       | Theory                                | Practical              | Theory Examination              | ORAL*              |            |
| Details of Evaluation | Average of two tests of 20 marks each | i. One PST of 25 marks | Term End Theory Exam (03 hours) | As per Proforma-IV |            |
| Marks                 | <b>20</b>                             | --                     | <b>80</b>                       | <b>50 I</b>        | <b>150</b> |

**Rationale:**

The course caters to the need of technician engaged in the investigation, planning, construction and maintenance of road, bridge, railway and tunnels. In practical field such a component of transportation is a specialized branch of engineering. This subject aims to imparting basic knowledge about roads, railways, bridges and tunnels in respect of their various types, materials used functions of component parts, method of construction, planning, aspects of supervision and maintenance.

**COMPETENCY**

Applying knowledge of components of Transportation Engineering for development of Infrastructure:

**Cognitive:** Understanding and applying knowledge of transportation Engineering.

**Psychomotor:** i) Conducting practical am on bitumen. ii) Conducting under construction site visits.

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

**COURSE OUTCOMES:**

**CEG310-1** Identify types of roads and implements the geometrical design features of different types of roads.

**CEG310-2** Construction methods of different types of roads.

**CEG310-3** Choose the shape of tunnel & Identify the methods of tunnel surveying and its construction.

**CEG310-4** Identify different component parts and functions of permanent way.

**CEG310-5** Identify the terms related to permanent way & track maintenance.

**CEG310-6** Illustrate site selection, component parts and maintenance of bridge.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

B)

C) PRACTICAL/EXERCISE WORK

| Programme Outcomes POs and PSOs   |   |                          |   |  |  |                            |                            |                         |                                      |                                  |
|---|---|--------------------------|---|--|--|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
| Competency and COs  | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of environmental engineering (water supply and sanitary engineering) to solve engineering problems. | 3   | 3                        | 3                                       | 2  | 2  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG310-1</b> Identify types of roads and implements the geometrical design features of different types of roads.                     | 3   | 3                        | 3                                       | 2  | 1  | 2                          | 2                          | 3                       | 1                                    | 2                                |
| <b>CEG310-2</b> Construction methods of different types of roads.   | 3   | 3                        | 2                                       | 2  | 2  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG310-3</b> Choose the shape of tunnel & Identify the methods of tunnel surveying and its construction.                             | 3   | 3                        | 3                                       | 2  | 2  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG310-4</b> Identify different component parts and functions of permanent way.  | 3   | 3                        | 3                                       | 2  | 2  | 1                          | 1                          | 3                       | 3                                    | 2                                |
| <b>CEG310-5</b> Identify the terms related to permanent way & track maintenance.  | 3   | 3                        | 3                                       | 2  | 2  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG310-6</b> Illustrate site selection, component parts and maintenance of bridge.   | 3   | 3                        | 3                                       | 2  | 2  | 2                          | 2                          | 3                       | 3                                    | 1                                |



**Practical Exercises and related skills to be developed :**

The following practical exercises shall be conducted as Continuous Assessment Work as detailed in the *Laboratory for Transportation Engineering* developed by the Institute in practical sessions of batches of about 20 students:

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed  | Course Outcome                    |
|--------|---|--|-----------------------------------|
| 1.     | <p><b>A) List of Practicals (any four):-</b></p> <p>1 Penetration test on bitumen.<br/>2 Softening point test on bitumen.<br/>3 Ductility test on bitumen<br/>4 Flash and fire point test on bitumen.<br/>5 Viscosity test on bitumen<br/>6 Extraction of bitumen</p>   | <p>1. Self learning ability using laboratory journal<br/>2. Applying concepts studied<br/>3. Drawing real view diagrams of equipments.<br/>4. Time management and team working skills.<br/>5. Presentation skills<br/>6. Information collection regarding grade of bitumen.<br/>7. Understand different properties of bitumen.</p> | CEG310-3                          |
| 2.     | <p><b>Visits Report with detailed Report (any four):-</b></p> <p>1) Visit to WBM road under construction<br/>2) Visit to concrete road under construction<br/>3) Visit to Bituminous road under construction<br/>4) Visit to Bridge site to study component parts<br/>5) Visit to Railway station to study station details and track geometric.</p>   | <p>1. Time management, team working.<br/>2. Studying component parts of roads, railways, bridges.<br/>3. Understand, prepare and interpret the drawings related to work.<br/>4. Understand the procedure of construction of different types of road.</p>   | CEG310-3<br>CEG310-6<br>CEG310-10 |
| 3.     | <p><b>C) SUGGESTED MICRO-PROJECTS</b><br/><b>Any one project for group of three to five students.</b></p> <p>i) Inspect the nearby railway track, bridge or tunnel (anyone) to enumerate the defects (if any) and prepare the report suggesting the remedial measures for ensuring its stability.<br/>ii) Draw the cross-section of rail components and layout of a railway station and yard. Prepare the detailed report with site photographs.<br/>iii) Collect all the details of all types of existing NH, SH across the country.<br/>iv) Any other micro-project suggested by subject faculty on similar line.</p> | <p>1. Information collection and presentation in the form of report.<br/>2. Motivation through field exposure.<br/>3. Developing self learning ability.</p>  |                                   |

**SECTION I**

| Sr. no.  | Topics  | Teaching (Hours) | Theory evaluation Marks |
|--|---|------------------|-------------------------|
| <b>A) Roads</b>  |   |                  |                         |
| <i>Course Outcome CEG310-1</i> Identify types of roads and implements the geometrical design features of different types of roads. |   |                  |                         |
| <b>1</b>   | <p><b>Introduction with Geometric Design</b></p> <p>1.1 Importance of Transportation Engg.<br/>1.2 Classification of Roads<br/>1.3 Alignment- selection, requirement &amp; factors affecting<br/>1.4 Brief introduction of traffic volume study.<br/>    Cross section in embankment &amp; in cutting, right of way, width of carriage way, shoulder, camber – definition and objects. With IRC values.<br/>1.5 Gradients – definition - types, IRC values, sight distance – types and various components.<br/>1.6 Super elevation- Definition, minimum and maximum values and objects.</p> | <b>10</b>        | <b>14</b>               |
| <i>Course Outcome CEG310-2</i> Construction methods of different types of roads.   |   |                  |                         |
| <b>2</b>   | <p><b>Construction of road</b></p> <p>2.1 Introduction to Rigid &amp; Flexible Pavements.<br/>2.2 Concept of W.B.M Roads , Construction procedure<br/>2.3 Technical terms - Bitumen, Asphalt, Cutback, Tar, Emulsion, Seal coat, Prime coat, Tack coat, surface dressing, grouted macadam, semi and full grout.<br/>2.4 Construction procedure.-bituminous carpet, bituminous concrete, bituminous bound macadam<br/>2.5 Concrete Roads - advantages and disadvantages, Construction procedure- Alternate and continuous bay method, Joints- necessity and types</p>                        | <b>11</b>        | <b>12</b>               |
| <b>B)Tunnel</b>  |   |                  |                         |
| <i>Cour Outcome CEG310-3</i> Choose the shape of tunnel & Identify the methods of tunnel surveying and its construction.           |   |                  |                         |
| <b>3</b>   | <p><b>3A. Introduction of tunnels</b></p> <p>3A.1 Necessity of tunnels.<br/>3A.2 Advantages and disadvantages of tunnels.<br/>3A.3 Shapes of tunnel &amp; its suitability.</p> <p><b>3A.4 Tunnel surveying -</b></p> <p>    3.4.1 Initial surveys<br/>    3.4.2 Setting out the alignment of tunnel on the ground<br/>    3.4.3 Transferring the alignment through shafts<br/>    3.4.4. Shaft – purpose and construction</p>   | <b>06</b>        | <b>08</b>               |

| Sr. no. | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---------|--|------------------|-------------------------|
|         | <b>3B Tunnelling – Construction &amp; its maintenance</b><br><br>3B.1 Tunneling in soft rock –Different methods(only names), Shield method (Explain in brief)<br>3B.2 Tunneling in hard rock -<br>3B.3 Methods of tunneling –shield method, full face heading method,<br>3B.4 Lining of tunnels – purpose and factors affecting<br>3B.5 Tunnel Maintenance- Purpose measure to be taken for proper maintenance | <b>05</b>        | <b>06</b>               |
|         | <b>Total</b>   | <b>32</b>        | <b>40</b>               |

### Section II

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b>C) Railways</b>  |  |                  |                         |
| <i>Course Outcome CEG310-4</i> Identify different component parts and functions of permanent way. |  |                  |                         |
| <b>4</b>  | <b>Permanent Way</b><br><br>4.1. Definition, requirements, component and their functions, coning of wheels.<br>4.2 Gauges – Different types<br>4.3 Rails – Functions, types, dimensions of Flat Footed Rails, Creep of rails, Causes of creep.<br>4.4 Sleepers – Function of sleepers and their requirements, list of Sleepers, sleeper density.<br>4.5 Rail fixture and fastenings – Fish plate , spikes , their types ,bolts , chairs , blocks , keys , bearing plates .<br>4.6 Ballast – Functions and requirements, different types, their merits and demerits | <b>08</b>        | <b>14</b>               |
| <i>Course Outcome CEG310-5</i> Identify the terms related to permanent way & track maintenance.   |  |                  |                         |
| <b>5</b>  | <b>5.1 Technical terms &amp; track maintenance</b><br><br>5.1 Points and crossings-<br>5.1.1 Definition, necessity, important technical terms,<br>5.1.2 Left hand and Right hand turnouts<br><br><b>5.2 Stations and Yards –</b><br><br>5.2.1 Stations - Definition, site selection, requirements, Classification.<br>5.2.2 Yards – Definitions ,types   | <b>12</b>        | <b>12</b>               |

| Sr. no.  | Topics  | Teaching (Hours) | Theory evaluation Marks |
|--|---|------------------|-------------------------|
|  | <p><b>5..2.3 Track Maintenance-</b><br/>Necessity, Classification, Tools required for track maintenance with their function, Organization of track maintenance, duties of permanent way<br/>Inspector, gang mate and key man.</p>   |                  |                         |
| <b>D) Bridges</b>  |   |                  |                         |
| <i>Course Outcome CEG310-6 Illustrate</i> site selection, component parts and maintenance of bridge.   |   |                  |                         |
| 6  | <p><b>Bridge Components &amp; its maintenance</b></p> <p>7.1 Factors affecting Site selection and Alignment of Bridges<br/>7.2 Substructure – foundation, pier, abutment, wing walls – Functions and types.<br/>7.3 Superstructure – Components Slab, Girder, Box only<br/>7.4 Types of Bearings for R C C Bridge<br/>7.5 Approaches- types<br/>7.6 Afflux, span, scour, waterway, freeboard, clearance, economic span</p> <p><b>7.7 Types of Bridges</b><br/>7.7.1 Definition and Classification of Bridges<br/>7.7.2 Definition and types of causeway ( No sketches) &amp; culvert<br/>7.7.3 Sketches , merits &amp; demerits of RCC girder bridge, Prestressed girder bridge, simple suspension bridge</p> <p><b>7.8 Inspection &amp; maintenance</b><br/>7.8.1 Inspection of bridges-General points to be observed, Pre and post monsoon inspection<br/>7.8.2 Maintenance of bridges – types—routine and special Maintenance.</p> | <b>12</b>        | <b>14</b>               |
|  | <b>Total</b>  | <b>32</b>        | <b>40</b>               |
| <p>Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> |   |                  |                         |

**Specification table for setting question paper for semester end theory examination.**

| Topic No. | Name of topic                                   | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---|--|------------|-------------|----------------|-------------|
|           |   | Remember                                     | Understand | Application |                |             |
| 1         | Introduction with Geometric Design              | 04   | 04         | 06          | CEG310-1       | 14          |
| 2         | Construction of road                            | 02   | 04         | 06          | CEG310-2       | 12          |
| 3         | 3A. Introduction of tunnels                     | 04   | 04         | -           | CEG310-2       | 08          |
|           | 3B. Tunnelling – Construction & its maintenance | -  | 04         | 02          | CEG310-3       | 06          |
| 4         | Permanent Way                                   | 04   | 04         | 06          | CEG310-4       | 14          |
| 5         | Technical terms & track maintenance             | 02   | 04         | 06          | CEG310-5       | 12          |
| 6         | Bridge Components & its maintenance             | 04   | 04         | 06          | CEG310-6       | 14          |
|           | <b>Total</b>                                    | <b>20</b>                                    | <b>28</b>  | <b>32</b>   |                | <b>80</b>   |

**A) INDUSTRIAL EXPOSURE :**

(Included in *Laboratory Manual for Transportation Engg*)

| SN | Mode of Exposure                     | Topic                                 |
|----|--------------------------------------|---------------------------------------|
| 1. | Field examples of course application | Every chapter of theory syllabus      |
| 2. | Field examples of course application | Contineous Assessment-work assignment |

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## ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

### g) Continuous Assessment work Criteria :

#### i) Continuous Assessment of Practical Assignments:

Every practical assignment shall be assessed for 25 marks as per following criteria :

| Domain       | Particulars                            | Marks out of 25 |
|--------------|--|-----------------|
| Cognitive    | Understanding                          | 05              |
|              | Application                            | 05              |
| Psychomotor  | Operating Skills                       | 05              |
|              | Drawing / drafting skills/presentation | 05              |
| Affective    | Discipline and punctuality             | 05              |
| <b>TOTAL</b> |  | <b>25</b>       |

#### ii) Progressive Skill Test :

One mid-term *Progressive Skill Test* of 25 marks shall be conducted.

Final marks of continuous assessment work shall be awarded as per *Assessment Pro-forma IV*

## INSTRUCTIONAL STRATEGIES:

### Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students are to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

### Teaching and Learning resources:

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL :**

**a) Books / Journals / IS Codes**

| <b>Sr. No.</b> | <b>Author</b>              | <b>Title</b>              | <b>Publisher</b>              |
|----------------|----------------------------|---------------------------|-------------------------------|
| 1.             | N.L.Arrora                 | Transportation Engg.      | IPH New Delhi                 |
| 2.             | Khanna& Justo              | Highway Engg.             | Nemchand and brothers, Roorki |
| 3.             | S. C. Saxena&SatyapalArora | Railway Engg.             | DhanpatRai and Sons           |
| 4.             | S. C. Saxena               | Tunnel Engg,              | DhanpatRai and Sons           |
| 5.             | Birdi and Ahuja            | Road, railway and bridges | Standard book house           |

**COURSE ID :**

**Course Name : ADVANCE CONSTRUCTION TECH. & EQUIPMENT (Elective-1)**

**Course Code : CEG311**

**Course Abbreviation : GACT**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : - Nil –**

**Teaching Scheme:**

| Scheme Component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |           | Term End Examination            |                |                             | Total      |
|-----------------------|---------------------------------------|-----------|---------------------------------|----------------|-----------------------------|------------|
|                       | Theory                                | Practical | Theory Examination              | Practical Work | Oral Examination (Internal) |            |
| Details of Evaluation | Average of two tests of 20 marks each | --        | Term End Theory Exam (03 hours) | -----          | As per Proforma-II          |            |
| Marks                 | <b>20</b>                             | --        | <b>80</b>                       | ----           | <b>25I</b>                  | <b>125</b> |

**RATIONALE :**

In the recent years large developments have taken place in the process of construction methods in the Civil Engineering Industry. Various new innovative techniques, variety of plants and equipments are used on small scale to large scale civil engineering projects to obtain quality construction and productivity. These emerging trends in Civil Engineering help to complete the undertaken projects within prescribed schedule, saves the natural resources and to make the projects eco-friendly. This subject is framed to induce knowledge of advanced techniques and equipments used on construction sites.



**COMPETENCY:**

Apply knowledge of advance concreting methods and construction equipments to solve construction problems as follows.

**Cognitive: Understanding** and applying advance concreting methods identify appropriate construction equipments as per the need of site.

**Psychomotor:** i) Knowing operation of different equipments.ii)Drawing different types of Equipment.

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation vi) hygiene vii) civic sense

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation

| Competency and COs  | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|---|--|-----------------------|--------------------------------------|---|--|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> Apply knowledge of advance concreting methods and construction equipments to solve onstruction problems  | 3  | 3                     | 2                                    | 1   | 2  | 3                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG311-1</b> understands and decides appropriate advanced concreting method and grouting technique.  | 2  | 2                     | 2                                    | 2   | 3  | 1                       | 2                       | 2                    | 2                                 | 3                             |
| <b>CEG311-2</b> Explain Ground improvement techniques and Slope stabilization methods   | 3  | 2                     | 3                                    | 2   | 3  | 3                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG311-3</b> Decide advanced formwork system   | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG311-4</b> Recommend the suitable Hoisting And conveying equipments, Earth work equipments for the given situation.  | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG311-5</b> Recommend the suitable tools and equipments for Concreting ,Aggregate Manufacturing and Road construction Equipments as per the the given situation | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG311-6</b> Suggest the equipment management techniques for the given project   | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |

## COURSE OUTCOMES

- CEF311-1. -Understand and decide appropriate advanced concreting method and grouting Technique.
- CEF311-2 Explain Ground improvement techniques and Slope stabilization methods
- CEF311- 3- Decide advanced formwork system
- CEG311-4- Recommend the suitable Hoisting and conveying equipment, Earth work Equipments for the given situation
- CEG311-5- Recommend the suitable tools and equipments for Concreting, Aggregate Manufacturing And Road construction Equipments as per the the given situation.
- CEF311-6-.Suggest the equipment management techniques for the given project.

## CONTENTS :

### PRACTICALS / EXERCISE WORK-

| Sr No . | Title of Practical Exercise  | Skills / Competencies to be developed  | Course Outcome       |
|---------|--|--|----------------------|
| 1       | <b>Field visits and use of digital techniques to study</b><br>Advance concreting techniques<br>Grouting methods<br>Slope stabilization techniques<br>Advanced formworks<br>Working of various types of construction equipments<br>RMC plant<br>Hotmix bituminous plant<br>Stone crusher unit | 3. Information collection and presentation in form of report<br>4. Motivation through field exposure<br>5. Presentation skills | CEF311-1 to CEF311-6 |
| 2       | <b>Assignment work.</b><br>1.Advance concreting methods<br>2.Grouting<br>3.Soil reinforcing techniques.<br>4. Formwork.<br>5. Hoisting and conveying equipments.<br>6. Earth moving equipments.<br>7. Stone crushers and concreting equip.<br>8.Miscellaneous equipments and Management.     | 11. Detailed assignment on each chapter.   | CEF311-1 to CEF311-6 |

|   |  |   |  |
|---|--|---|--|
| 3 | <p><b>Suggested Micro-projects:</b></p> <p>The micro-project could be industry application based, internet-based, workshop- based, laboratory-based or field-based. Each micro-project should encompass two or more COs. Each student will have to maintain dated work diary consing of individual contribution in the project work and give a seminar presentation of it before submission</p> <p><b>Any one project for group of three to five students.<br/>. Students should visit and prepare a miniproject report</b></p> <ol style="list-style-type: none"> <li>1.Prepare the chart showing working of various plants</li> <li>2.Prepare a model of anyone equipment/machine</li> <li>3.Prepare a report on advanced concrete technique, formwork</li> <li>4.Elaborate the process of Ground improvement and slope stabilization</li> <li>5.Make posters showing working of various equipments,machines             <ol style="list-style-type: none"> <li>a. Safety and its awareness.</li> <li>b. Preparethechartsshowingdifferenttypesofsafetyr ulesandregulationsofsite.</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>1.Information collection and presentation in the form of report.</li> <li>2.Motivation through field exposure.</li> <li>3.Developing self learning ability.</li> </ol> |  |
|---|--|---|--|

## THOERY

### Section I

| Sr. No.  | Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>Course Outcome: CEG311-1-understand and decide appropriate advanced concreting method and grouting technique.</b> |  |                  |                           |
| <b>1.</b>  | <p><b>Advanced Concreting methods and grouting</b></p> <p>1.1 Brief idea regarding :-<br/>Self Healing Concrete,<br/>Fibre-Reinforced Concrete,<br/>High Strength concrete,<br/>High Performance Concrete,</p> | <b>12</b>        | <b>20</b>                 |

| Sr. No.   | Topics  | Teaching (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
|   | <p>Nano concrete<br/>Ready Mix concrete ( RMC)<br/>Tremix Concreting</p> <p><b>Grouting</b><br/>Necessity of grouting<br/>Materials used for grouting,<br/>Grouting pressure, drilling pattern, Equipment for grouting<br/>Types of grout- cement grouting, clay grouting, chemical grouting<br/>Asphalt grouting. Uses of grouts in buildings, dams &amp; tunnels.</p> |                  |                           |
| <b>Course Outcome: CEG311-2-Explain Ground improvement techniques and Slope stabilization methods</b>   |   |                  |                           |
| 2   | <p>Ground improvement techniques-Advanced piling techniques – Stone Column, Vibro Floatation, Micro piles, Soil Nailing, Vertical drains- Sand Drains, Pre-Fabricated Vertical Drains, Thermal Methods- soil heating and soil freezing.<br/>Slope stabilization in cutting and embankment by soil reinforcing techniques</p>  | 06               | 10                        |
| <b>Course Outcome: CEF311- 3- Understand and Decide advanced formwork system</b>  |   |                  |                           |
| 3   | <p><b>Advanced Formwork systems</b><br/>a. Slip formwork : process of concreting with slip form<br/>3.2 Maivan :Brief idea<br/>3.3 Form work for Bridges,<br/>3.4 Form work <b>Heavy</b> Structures</p>   | 06               | 10                        |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |   |                  |                           |

**Section II**

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b>Course Outcome: CEG311-4-</b> Recommend the suitable.Hoisting and conveying equipments, Earth work equipments for the given situation  |  |                  |                         |
| 4   | <p><b>Hoisting and conveying equipments</b><br/>Hoisting equipments : Principles and working of Tower crane, Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes and Derricks<br/>Conveying equipments: Different types of trucks, dumpers, belt conveyors.</p> <p><b>Earth work equipments</b><br/>Excavating equipments : Working and output of bulldozers, Scrapers, Graders, Power Showels, Loader with Back Hoe, Draglines<br/>Compacting equipments : Uses of rollers, types of rollers : plain rollers, sheep footed rollers, pneumatic rollers, Rammers : use and working</p> | 12               | 18                      |
| <b>Course Outcome: CEG311-5-</b> Recommend the suitable tools and equipments for Concreting ,Aggregate Manufacturing and Road construction Equipments as per the the given situation                      |  |                  |                         |
| 5   | <p><b>Concreting ,Aggregate Manufacturing and Road construction Equipments</b><br/>Concreting equipments: Types of concrete mixers, weigh batching equipments, Equipments for transportation of concrete: trolleys, lifts, Transit mixer. Concrete Vibrators: Needle vibrators and Screed vibrators. Automatic concrete plants</p> <p>Stone Crushers: Types of stone crushers, working and capacities, equipment for the production of artificial sand<br/>Compoments and Working of hot mix bitumen plant, Bitumen paver</p>  | 09               | 16                      |
| <b>Course Outcome: CEG311-6-</b> .Suggest the equipment management techniques for the given project.  |  |                  |                         |
| 6   | <p><b>Equipment management</b><br/>Equipment management : Standard equipment, special equipment, selection of equipment, Owning and hiring an equipment, economic life of an equipment ,maintenance of equipment</p>   | 03               | 06                      |
| <b>Total</b>  |  | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |  |                  |                         |

**Specification table for setting question paper for semester end theory examination**

| Topic No. | Name of Topic  | Distribution of Marks (Cognitive level wise) |            |           | Total     | Course Outcomes |
|-----------|--|--|------------|-----------|-----------|-----------------|
|           |  | Remember                                     | Understand | Apply     |           |                 |
| 1         | Advance Concreting methods and Grouting                              | 04   | 08         | 08        | 20        | CEF311-1        |
| 2         | Ground improvement techniques  | 02   | 04         | 04        | 10        | CEF311-2        |
| 3         | Advanced Formwork systems  | 02   | 04         | 04        | 10        | CEF311-3        |
| 4         | Hoisting and conveying equipments<br>Earth work equipments           | 02   | 08         | 08        | 18        | CEF311-4        |
| 5         | Concreting, Aggregate Manufacturing and Road construction Equipments | 04   | 06         | 06        | 16        | CEF311-5        |
| 16        | Equipment management   | 02   | 04         | --        | 06        | CEF311-6        |
|           | <b>Total</b>   | <b>16</b>                                    | <b>34</b>  | <b>30</b> | <b>80</b> |                 |

**INDUSTRIAL EXPOSURE**

| SN | Mode of Exposure                     | Topic  |
|----|--------------------------------------|--|
| 1. | Field examples of course application | Topics of theory syllabus  |
| 2. | Field examples of course application | Assignment on study of professional drawings, use of software and field visits |
| 3. | Field visits                         | Reports writing work   |

**IMPLEMENTATION STRATEGY:**

**Instructional strategies:**

1. Lectures and discussions.
2. Time bound regular home assignments.
3. Industrial visits.
4. Case study.
5. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
6. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning**

**Teaching and Learning Resources:**

1. Chalk-board.
2. Models and Magnetic cut-outs.
3. Demonstrative charts.
4. Computer aided presentation

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**INSTRUCTIONAL STRATEGY:**

1. Lecture cum discussions.
2. Field Visits.
3. video films

**Reference Books.**

| Sr No | Author                          | Title  | Publisher              |
|-------|---------------------------------|--|------------------------|
| 01    | R LPeurifoy                     | Construction Planning,<br>Equipment, and Methods | McGowan-Hill Education |
| 02    | S.C.Sharma                      | Construction Equipment And<br>Its Management     | Khanna Publication     |
| 03    | S. A. Rasal , M. N.<br>Gangrade | Advanced Construction<br>Techniques And Equip    |                        |
| 04    | Sushilkumar                     | Building construction                            | PhadkePrakashan.       |
| 05    | S.C.Rangwala                    | Building construction                            | Khanna Publishers      |
| 06    | B.C.Punmia                      | Building Construction                            | SatyaPrakashan         |
| 07    | S.K.Sharma                      | Building Construction                            | S.Chand& co.           |

**COURSE ID :**

**Course Name : Advanced Construction Materials**  
**Course Code : CEG312**  
**Course Abbreviation : GACM**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : None**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |           | Term End Examination            |                |                              | Total |
|-----------------------|---------------------------------------|-----------|---------------------------------|----------------|------------------------------|-------|
|                       | Theory                                | Practical | Theory Examination              | Practical Work | Oral Examination (Internal)* |       |
| Details of Evaluation | Average of two tests of 20 marks each | --        | Term End Theory Exam (03 hours) | -----          | As per Proforma-IV           |       |
| Marks                 | 20                                    | --        | 80                              | ----           | 25 I                         | 125   |

**RATIONALE:**

A great awareness & huge concern towards environmental protection compelled us to discover, develop & make use of eco friendly construction materials. Also a trend of utilizing maximum natural resources like rain water, sunlight, wind etc change the planning & requirement of construction materials. In the recent past, Composite materials, Plastics, Aluminium and ceramics have been the dominant emerging materials. Students of civil engineering should be familiar with all new construction materials.

**COMPETENCY**

Apply facts, concepts, and principles in advanced Construction Materials to solve engineering problems as follows:

**Cognitive:** Understanding and applying principles in construction materials to evolve best Material for various construction projects.

**Psychomotor:** i) To have an idea of best material ii) Suggest suitable material for Construction purpose.

**Affective:** Attitude of i) accuracy ii) safety iii) punctuality iv) aesthetic presentation



**COURSE OUTCOMES:**

**CEG312-1** To know History and developments of building materials.

**CEG312-2** Know different advanced materials for wall construction.

**CEG312-3** Know different materials available for doors, windows and partition walls and Suitability of each.

**CEG312-4** Know types of Flooring, cladding, ceiling panels and its suitability.

**CEG312-5** Know various roofing materials and its applications.

**CEG312-6** To know advanced types of pipes and fixtures in plumbing, to know Geo-synthetics, painting and water proofing.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX [ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation]**

| Competency and COs   | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|--|---|-----------------------|--------------------------------------|---|--|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> Apply principles of maintenance and rehabilitation of structures  | 3   | 3                     | 2                                    | 1   | 2  | 1                       | 2                       | 2                    | 1                                 | 3                             |
| <b>CEG312-1</b> To know History and developments of building materials.  | 2   | 2                     | 2                                    | 2   | 3  | 1                       | 2                       | 2                    | 2                                 | 3                             |
| <b>CEG312-2</b> Know different advanced materials for wall construction  | 3   | 2                     | 3                                    | 2   | 3  | 3                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG312-3</b> Know different materials available for doors, windows and partition walls and suitability of each.             | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG312-4</b> Know types of Flooring, cladding, ceiling panels and its suitability.  | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG314-5</b> Explain repair work of concrete and masonry buildings  | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG312-6</b> To know advanced types of pipes and fixtures in plumbing, to know Geo-synthetics, painting and water proofing. | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |

**PRACTICAL / EXERCISE WORK**

**Practical Exercises and related skills to be developed:**

The following exercises shall be conducted as continuous assessment work in practical sessions of batches of about 20 students:

| Sr No. | Title of Practical Exercise  | Skills / Competencies to be developed  | Course Outcome |
|--------|--|--|----------------|
| A      | <p><b>Continuous assessment work contains assignments, market survey reports, information brochure, leaf-lets and pamphlets on the following</b></p> <ol style="list-style-type: none"> <li>1) Fly Ash</li> <li>2) Doors and windows made up of Advanced materials</li> <li>3) Partition panels</li> <li>4) Structural Glazing</li> <li>5) Flooring</li> <li>6) Cladding, ceiling panels</li> <li>7) Roofs and pre cast roofing elements</li> <li>8) Plumbing</li> <li>9) Construction Chemicals</li> <li>10) Geo-synthetics Heat and sound insulating materials Acoustic materials</li> </ol>                                     | <ol style="list-style-type: none"> <li>1. Information collection and presentation</li> <li>2. Motivation through field exposure</li> <li>3. Measuring sizes and it's suitability</li> <li>4. Drawing real view diagrams</li> <li>5. Time management, team working and presentation skills</li> <li>6. Choice of proper material</li> <li>7. Applying concepts studied</li> </ol> | CEG312-1 to 6  |
| B      | <p><b>Micro project:</b><br/><b>Any one project for group of three to five students.</b></p> <ol style="list-style-type: none"> <li>1. To prepare and present a case study of above assignments in a seminar type situation</li> <li>2. Collect data of pre-stressed components manufactured in your vicinity.</li> <li>3. Write a detailed report of visit to anyone prefabricated unit.</li> <li>4. Collect data for materials required for precast elements, with their suppliers, sale price etc.</li> <li>5. Carry out market survey for identifying various advanced construction materials and prepare a report.</li> </ol> | <ol style="list-style-type: none"> <li>1. Information collection and presentation in the form of report.</li> <li>2. Motivation through field exposure.</li> <li>3. Developing self-learning ability.</li> </ol>   |                |

**CONTENT: THEORY**

**Section I**

| <b>Sr. No.</b>  | <b>Topics/ Sub Topics</b>   | <b>Teaching (Hours)</b> | <b>Theory Evaluation (Marks)</b> |
|---|---|-------------------------|----------------------------------|
| <b>Course Outcome - CEG312-1</b> To know History and developments of building materials.  |   |                         |                                  |
| <b>1</b>  | <b>Introduction</b><br>1.1 Introduction to Innovative building Materials,<br>1.2 History & developments,<br>1.3 Future building materials<br>1.4 Scope & Limitation.  | <b>05</b>               | <b>08</b>                        |
| <b>Course Outcome - CEG312-2</b> Know different advanced materials for wall construction.   |   |                         |                                  |
| <b>2</b>  | <b>Wall</b><br>2.1 Stabilized ,compressed Earth Blocks , Fal-G stabilized Mud Blocks,<br>2.2 Bricks- ,Fly ash, Sand- Lime, Red Mud burnt3D printed brick, Bricks made up of cigarette butts, SBA (Sugar Bagas Ash)<br>2.3 Fly ash – Lime- Gypsum (Fal-G ) products :- Lato/ Precast Stone – Concrete – Hollow Blocks,<br>2.4 Fly ash based light weight Aerated & cellular concrete walling,<br>2.5 Bonding System e.g. Rat-Trap Bond<br>2.6 Composite Ferro cement systems<br>2.7 Ready mix plastering material<br>2.8 Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards Adhesives,<br>( Only description, advantages, & application ) | <b>09</b>               | <b>16</b>                        |
| <b>Course Outcome - CEG312-3</b> Know different materials available for doors, windows and partition walls and suitability of each.   |   |                         |                                  |
| <b>3</b>  | <b>Doors, windows and partition panels</b><br>3.1 UPVC<br>3.2 Precast RCC<br>3.3 Resin or Oxi chloride Cement Bonded Saw dust based ,<br>3.4 Natural Fibre Reinforced Polymer Composite, Ferro cement Shutters,<br>3.5 FRP – Fibre reinforced plastic<br>3.6 Aluminium- plain, powder coated, Anodized<br>3.7 Heat and sound insulating materials<br>(Only description, advantages, & application)  | <b>10</b>               | <b>16</b>                        |
|   | <b>Total</b>  | <b>24</b>               | <b>40</b>                        |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                         |                                  |

**Section II**

| Sr. No.   | Topics/ Sub Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>Course Outcome - CEG312-4</b> Know types of Flooring, cladding, ceiling panels and its suitability   |  |                  |                           |
| 4   | <b>Flooring, cladding, ceiling panels:</b><br>4.1 Ceramic, Marbonite, Vitrified, Artificial Marble flooring, Pavements Blocks.Laminated timber 3D tiles<br>4.2 Synthetic flooring: PVC, linoleum and rubber flooring, Industrial flooring: epoxy, tremix and glass flooring. Other flooring: cork-tile and asphalt flooring<br>4.3 Ceramic, Cement based artificial cladding tiles, Ready to use Tiles- Porch, Riser, Tread etc.<br>4.4 False Ceiling boards, Gypsum based paneling & ceiling tiles<br>4.5 Study of materials and constructional details of Expansion joints Curtain Walls and Structural Glazing stabilized mud blocks, micro concrete tiles, pre cast roofing elements.<br>(Only description, advantages & application ) | 7                | 12                        |
| <b>Course Outcome - CEG312-5</b> Know various roofing materials and its applications.   |  |                  |                           |
| 5   | <b>Roofs:</b><br>5.1 Life extended Thatch roofing,<br>5.2 Pyramidal Brick roofing<br>5.3 Cement bonded Fibre Roofing sheets,<br>5.4 Micro concrete tile / stone Patti, Precast brick panels<br>5.5 Ferro cement channel / shell units,<br>5.6 Precast Waffle units/Channel units /cored units/ In-situ Thin Ribbed Slabs.<br>(Only description, advantages & application )   | 7                | 12                        |
| <b>Course Outcome - CEG312-6</b> To know advanced types of pipes and fixtures in plumbing, To know Geo-synthetics, painting and water proofing.   |  |                  |                           |
| 6   | <b>Other Construction materials</b><br>6.1 Plumbing Materials – Plumbing pipes & fixtures, composite copper, PPR<br>6.2 Thermo Mechanically Treated Steel sections (TMT)<br>6.3 Construction Chemicals used in - Roof slab, plaster, flooring & waterproofing.<br>6.4 Types and properties of acoustic materials.<br>6.5 Road Materials – Geo-synthesis, Noise Reducing Asphalt, porous pavement, plastic roads, solar roads, Anti-Icing Roads, Use of SBA (Sugar Bagas Ash) in concrete roads<br>6.6 Sustainable Materials – Ground Granulated Glass Blast Furnace slag (GGBS) concrete, Agro-gel Insulation, Cooling Bricks, Green Concrete, Timbercrete, Ferrock<br>(Only description, advantages & application)                        | 10               | 16                        |
| <b>Total</b>  |  | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                           |

**Specification table for setting question paper for semester end theory examination**

| Topic no. | Name of topic                    | Distribution of marks (Cognitive level-wise) |            |              | Course Outcome | Total marks |
|-----------|----------------------------------|--|------------|--------------|----------------|-------------|
|           |                                  | Remember                                     | Understand | Applica-tion |                |             |
| 1         | Introduction                     | 04   | 04         | -            | CEG312-1       | 08          |
| 2         | Wall                             | 04   | 04         | 08           | CEG312-2       | 16          |
| 3         | Doors windows & partition panels | 02   | 04         | 10           | CEG312-3       | 16          |
| 4         | Flooring, cladding and ceilings  | 04   | 04         | 04           | CEG312-4       | 12          |
| 5         | Roofs                            | 04   | 04         | 04           | CEG312-5       | 12          |
| 6         | Plumbing & other Misc.           | 04   | 08         | 04           | CEG312-6       | 16          |
|           | <b>Total</b>                     | <b>22</b>                                    | <b>28</b>  | <b>30</b>    |                | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**E) INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure                    | Topic                            |
|----|-------------------------------------|----------------------------------|
| 1. | Collecting Leaf-lets, Pamphlet      | Every chapter of theory syllabus |
| 2. | Observing actual advanced materials | For Part A & B                   |

**CONTINEOUS ASSESSMENT WORK CRITERIA FOR PRACTICAL & MICRO-PROJECT EXAMINATION**

**h) Assessment Criteria for Continuous Assessment work**

Every practical assignment shall be assessed for 25 marks as per following criteria:

| Domain      | Particulars                | Marks out of 25 |
|-------------|----------------------------|-----------------|
| Cognitive   | Understanding              | 02              |
|             | Application                | 03              |
| Psychomotor | Operating Skills           | 05              |
|             | Drawing / drafting skills  | 05              |
| Affective   | Discipline and punctuality | 05              |
|             | Decency and presentation   | 05              |
|             | <b>TOTAL</b>               | <b>25</b>       |

**ii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted.

Final marks of continuous assessment work shall be awarded as per *Assessment Pro-forma IV*

**INSTRUCTIONAL STRATEGIES :**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

**Suggested Micro-projects:**

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Item Bank
5. Leaf-lets, Pamphlet's, etc. pertaining to construction materials

**REFERENCE MATERIAL:**

**a) Books / Journals / IS Codes**

| Sr. No. | Author      | Title                  | Publisher                  |
|---------|-------------|------------------------|----------------------------|
| 1.      | Sushilkumar | Building construction  | Standard book house        |
| 2.      | B.C Punmia  | Building construction  | Standard book house        |
| 3.      | W.B.Meckay  | Building construction  | Pearson India              |
| 4.      | F. Mitchell | Building construction  | Batsford Ltd               |
| 5.      | -           | National Building Code | Bearau of Indian Standards |

|                            |                             |
|----------------------------|-----------------------------|
| <b>COURSE ID</b>           | <b>: CE</b>                 |
| <b>Course Name</b>         | <b>: HIGHER MATHEMATICS</b> |
| <b>Course Code</b>         | <b>: CEG313</b>             |
| <b>Course Abbreviation</b> | <b>: GHMT</b>               |

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : **Applied Mathematics,CEG301**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Tutorial         | 02           |         |

**EVALUATION SCHEME :**

| Component | Progressive Assessment                |                              | Term End                        |                | Total |
|-----------|---------------------------------------|------------------------------|---------------------------------|----------------|-------|
|           | Theory                                | Practical                    | Theory                          | Oral(Internal) |       |
| Duration  | Average of two tests of 20 marks each | Assignments given by teacher | Term End Theory Exam (03 hours) | ---            |       |
| Marks     | 20                                    | ----                         | 80                              | 25             | 125   |

**RATIONALE:**

Mathematics is an important pre-requisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of Mathematics is an effective tool to pursue and to master the applications in the engineering and technological fields. The connection between Higher Mathematics and its applications in real life can be understood and appreciated. Finite Differences helps in finding population, temperature of a city etc . Laplace Transform is used to solve ordinary differential equations.

**COMPETENCY:**

The course should be taught and implemented with the aim to develop the following qualities

- 1.Cognitive:** understanding ,remembering and applying principles of mathematics to engineering problems
- 2. Psychomotor:** To prepare difference table ,to compute interpolation ,extrapolation and missing values in engineering data
- 3. Attitude:** discipline, consistency, hard work , enhance concentration ,accuracy, punctuality, aesthetics

**COURSE OUTCOMES(CO's)**

The student will be able to:

**CEG 313.1:** Apply methods of finite differences to Engineering and technical field

**CEG313.2:** Apply rules and methods of partial differentiation to solve Engineering and Technical Problems

**CEG313.3:** To equip student with tools of Numerical methods to enable him to use in Engineering and technology

**CEG313.4:** To equip students with the techniques of solving Linear differential equations with constant Coefficients

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX [ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation]**

| Competency and COs  | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|---|--|-----------------------|--------------------------------------|---|--|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> Apply principles of maintenance and rehabilitation of structures                                 | 3  | 3                     | 2                                    | 1   | 2  | 1                       | 2                       | 2                    | 1                                 | 3                             |
| CEG 313.1: Apply methods of finite differences to Engineering and technical field                                   | 3  | 2                     | 2                                    | 2   | 1  | -                       | 3                       |                      |                                   |                               |
| CEG313.2: Apply rules and methods of partial differentiation to solve Engineering and Technical Problems            | 3  | 2                     | 2                                    | 2   | 1  | -                       | 3                       |                      |                                   |                               |
| CEG313.3: To equip student with tools of Numerical methods to enable him to use in Engineering and technology       | 3  | 2                     | 2                                    | 2   | 3  | -                       | 3                       |                      |                                   |                               |
| CEG313.4: To equip students with the techniques of solving Linear differential equations with constant coefficients | 3  | 2                     | 2                                    | 2   | 1  | -                       | 3                       |                      |                                   |                               |



**CONTENT:**

**A. THEORY :**

**Section I**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation |
|---|---|------------------|-------------------|
| <b><i>CEG 313 .1 Apply methods of finite differences to Engineering and Technical field</i></b>   |   |                  |                   |
| 1   | <b><u>Finite Differences</u></b><br><br>Finite differences, forward difference $\Delta$ , Backward differences $\nabla$ ,Operator E and Difference tables<br>1.1 Inverse of E , $\Delta, \nabla$<br>1.2 Factorial notations of polynomials<br>1.3 To find missing terms by using difference table<br>1.4 Newton's forward & backward difference interpolation | 12               | 20                |
| <b><i>CEG 313. 2 Apply rules and methods of partial differentiation to solve Engineering and technical Problems</i></b>   |   |                  |                   |
| 2   | <b><u>Partial Differentiation</u></b><br>2.1 Partial Derivatives of first order (Definition & Examples)<br>2.2 Partial Derivatives of higher order (Definition, Examples)<br>2.3 Homogeneous functions , Euler's theorem on homogeneous functions (Examples)<br>2.4 Jacobians (Definition, Examples)  | 12               | 20                |
|   | <b>Total</b>  | 24               | 40                |
| 1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.<br>2.In each topic corresponding applications will be explained |   |                  |                   |

Section II

| Sr. No.  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|--|---|------------------|---------------------------|
| <b>CEG313.3 : To find approximate solution of algebraic equations and simultaneous equations by various methods</b>  |   |                  |                           |
| 3  | <u><b>Numerical solution of Algebraic Equations</b></u><br>4.1 Bisection Method<br>4.2 Regula- Falsi Method<br>4.3 Newton-Raphson Method  | 06               | 10                        |
| <b>CEG313.3 : To find approximate solution of algebraic equations and simultaneous equations by various methods</b>  |   |                  |                           |
| 4  | <u><b>Numerical solution to simultaneous equations</b></u><br>4.1 Gauss Elimination Method<br>4.2 Jacobi's Method<br>4.3 Gauss-Seidel method  | 06               | 10                        |
| <b>CEG313.4 To equip students with the techniques of solving Linear differential equations with constant coefficients</b>  |   |                  |                           |
| 5  | <u><b>Linear Differential Equation With Constant Coefficient</b></u><br>5.1 Definition, Operator D, Inverse of D<br>5.2 To find Complementary Function of L.D.E. $f(D)y = X$ when<br>i) Roots are real and equal,<br>ii) Roots are real and unequal<br>iii) Roots are Imaginary<br>iv) Roots are a pair of equal imaginary roots<br><br>5.3 To find Particular Integral of $f(D)y = X$ where<br>i) $X = e^{ax}$<br>ii) $X = \sin ax$ or $\cos ax$ | 12               | 20                        |
|  | <b>Total</b>  | 24               | 40                        |
| <p>1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> <p>2.In each topic corresponding applications will be explained</p> |   |                  |                           |

**Specification table for setting question paper for semester end theory examination**

| Topic No. | Name of topic                                | Distribution of marks (level wise) |   |    | Total Marks | Course Outcome |
|-----------|--|------------------------------------|---|----|-------------|----------------|
|           |  |                                    |   |    |             |                |
| 1         | Finite Differences                           | 4                                  | 6 | 10 | 20          | CEG311-1       |
| 2         | Partial Differentiation                      | 4                                  | 6 | 10 | 20          | CEG311 - 2     |
| 3         | Numerical solution of Algebraic Equations    | 2                                  | 4 | 4  | 10          | CEG311-3       |
| 4         | Numerical solution to simultaneous equations | 2                                  | 4 | 4  | 10          | CEG311-3       |
| 5         | L.D.E. With constant coefficients            | 4                                  | 6 | 10 | 20          | CEG311-4       |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**PRACTICALS.**

Note: Practicals are to be used to get enough practice [One batch for 20 Students]

| SrNo. | Topic  | Tutorial Content (10 problems in each tutorial)                                       |
|-------|--|---|
| 1     | Finite Differences   | To evaluate examples on operators as $E$ , $\Delta$ , $\nabla$ and Factorial notation |
| 2     | Finite Differences   | To solve examples on Newton's forward & backward differences interpolation formulae   |
| 3     | Finite Differences   | To solve examples on Lagrange's interpolation formulae                                |
| 4     | Partial Differentials.   | To find Partial Derivatives of higher order and of Homogeneous functions              |
| 5     | Partial Differentials.   | To solve examples on Euler's theorem for homogeneous functions, Jacobian's            |
| 6     | Numerical solution of Algebraic Equations and simultaneous equations | To solve numerical examples on various methods  |
| 7     | Numerical solution of Algebraic Equations and simultaneous equations | To solve numerical examples on various methods  |
| 8     | L.D.E. With constant coefficient                                     | To find C.F. of various examples  |
| 9     | L.D.E. With constant coefficient                                     | To find P.I. of various examples  |
| 10    | L.D.E. With constant coefficient                                     | To solve various types of LDE's   |

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**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Tutorials

**Teaching and Learning resources:**

1. Chalk board
2. Item Bank
- 3 Formulae Charts
- 4 Power point presentation

**REFERENCE MATERIAL:**

**a) Books:**

| Sr. No. | Author          | Title                          | Publisher                             |
|---------|-----------------|--------------------------------|---------------------------------------|
| 1       | G.V. Kumbhojkar | Engineering Mathematics III    | Phadake Prakashan, Kolhapur           |
| 2       | P.N. Wartikar   | Applied mathematics            | Pune vidyarthi Griha Prakashan , pune |
| 3       | H.K. Dass       | Higher engineering mathematics | S.Chand publication                   |
| 4       | B.S.Grewal      | Higher engineering Mathematics | Khanna publication, New Delhi         |

**b) Websites**

- i) [www.khanacademy.org](http://www.khanacademy.org)
- ii) [www.easycalculation.com](http://www.easycalculation.com)
- iii) [www.math-magic.com](http://www.math-magic.com)

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**COURSE ID :**

**Course Name : MAINTENANCE AND REHABILITATION OF STRUCTURES- (Elective-1)**

**Course Code : CEG314**

**Course Abbreviation : GMRS**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : - Nil -**

**Teaching Scheme:**

| Scheme Component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |           | Term End Examination            |                |                             | Total |
|-----------------------|---------------------------------------|-----------|---------------------------------|----------------|-----------------------------|-------|
|                       | Theory                                | Practical | Theory Examination              | Practical Work | Oral Examination (Internal) |       |
| Details of Evaluation | Average of two tests of 20 marks each | --        | Term End Theory Exam (03 hours) | -----          | As per Proforma-IV          |       |
| Marks                 | 20                                    | --        | 80                              | ----           | 25 I                        | 125   |

**RATIONALE:**

The natural hazards lead to unfit the existing structures for their use by weakening the strength of members. Detailed investigation of failure pattern, evaluating strength of existing structures decides the remedial approach and techniques. For maintenance and rehabilitation, a rational and technical base is essential instead of leaving it to experience of masons. If the cost of maintenance and restoration happens to be intolerable then one has to obsolete the maintenance. Thus the estimate and preparation of tenders requires special attention.

**COMPETENCY :**

Apply principles of maintenance and rehabilitation structures as follows:

**Cognitive :** Understanding and applying principles of maintenance and rehabilitation structures.

**Psychomotor :** i) Calculating skills ii) drafting skills

**Affective :** Attitude of i) precision ii) accuracy iii) safety iv) punctuality

**COURSE OUTCOMES :**

- CEG314-1**-Explain requirements and types of maintenance of buildings.  
**CEG314-2**-Explain distress diagnostics and carry out inspection of damaged structure.  
**CEG314-3**-Explain weather effect on concrete structure.  
**CEG314-4** -Identify materials for repair and explain repair techniques.  
**CEG314-5**-Explain repair work of concrete and masonry buildings.  
**CEG314-6**-Explain demolition techniques for structures.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation]

| Competency and COs   | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|--|---|-----------------------|--------------------------------------|---|--|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> Apply principles of maintenance and rehabilitation of structures        | 3   | 3                     | 2                                    | 1   | 2  | 1                       | 2                       | 2                    | 1                                 | 3                             |
| <b>CEG314-1</b> Explain requirements and types of maintenance of buildings                 | 2   | 2                     | 2                                    | 2   | 3  | 1                       | 2                       | 2                    | 2                                 | 3                             |
| <b>CEG314-2</b> Explain distress diagnostics and carry out inspection of damaged structure | 3   | 2                     | 3                                    | 2   | 3  | 3                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG314-3</b> Explain weather effect on concrete structure                               | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG314-4</b> Identify materials for repair and explain repair techniques                | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG314-5</b> Explain repair work of concrete and masonry buildings                      | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEG314-6</b> Explain demolition techniques for structures                               | 3   | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |

**CONTENTS :**

**PRACTICALS / EXERCISE WORK-**

Practicals/Exercise work contains the following.

- 1) To prepare a study report on causes of deterioration and defects in one building. **(CEG314-1)**
- 2) To prepare the checklist for inspection of buildings regarding maintenance and demolition **(CEG314-2)**
- 3) To prepare a survey report of repair materials and construction chemicals for various Repair and maintenance works. **(CEG314-4)**
- 4) To prepare a survey report of repair tools and equipment for various repair and Maintenance works. **(CEG314-4)**
- 5) To prepare study report for causes of corrosion of steel reinforcement in RCC structure and suggest the remedial measures. **(CEG314-4)**
- 6) To prepare a study report of demolition, safety aspects in demolition of a structure. **(CEG314-6)**
- 7) **Micro project:** To prepare and present a case study of above assignments in a seminar type Situation

**THOERY**

**Section I**

| Sr. No.   | Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>Course Outcome: CEG314-1-Explain requirements and types of maintenance of buildings.</b>                 |  |                  |                           |
| <b>1.</b>   | <b>Maintenance of buildings-Introduction</b><br>1.1 Importance of maintenance<br>1.2 Types of maintenance<br>1.3 General maintenance : Painting of buildings, home electricity system  | <b>06</b>        | <b>12</b>                 |
| <b>Course Outcome: CEG314-2-Explain distress diagnostics and carry out inspection of damaged structure.</b> |  |                  |                           |
| <b>2</b>  | <b>Repair strategies-</b><br>2.1 Causes of distress in structures<br>2.2 Construction and design failures<br>2.3 Condition assessment and distress diagnostic technique<br>2.4 Inspection and evaluation of damaged structures | <b>09</b>        | <b>14</b>                 |

| Sr. No.   | Topics  | Teaching (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>Course Outcome: CEG314-3-</b> Explain weather effect on concrete structure.  |   |                  |                           |
| <b>3</b>  | <b>Durability and serviceability of concrete-</b><br>3.1 Quality assurance for concrete construction based on concrete properties like strength, permeability, cracking and thermal properties<br>3.2 Effects due to climate, temperature, chemicals and corrosion<br>3.3 Design and construction errors<br>3.4 Effects of covers | <b>09</b>        | <b>14</b>                 |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |   |                  |                           |

**Section II**

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b>Course Outcome: CEG314-4-</b> Identify materials for repair and explain repair techniques. |  |                  |                         |
| <b>4</b>  | <b>Materials and techniques for repair-</b><br>4.1 Materials for repair : Special concretes and mortar, concrete chemicals, construction chemicals, expansive cement, polymer concrete, sulphur infiltrated concrete, ferrocement, fibre reinforced concrete, rust eliminators and polymer coating for rebars, foamed concrete, dry pack, vacuum concrete, asphalt sheeting<br>4.2 Techniques for repairs : Guniting, grouting and shotcrete, epoxy injection, jacketing, shoring and underpinning,<br>4.3 Methods of corrosion protection : Corrosion inhibitors, corrosion resistant steel, coatings and cathodic protection | <b>09</b>        | <b>14</b>               |
| <b>Course Outcome: CEG314-5-</b> Explain repair work of concrete and masonry buildings.       |  |                  |                         |
| <b>5</b>  | <b>Repair, retrofitting and rehabilitation-</b><br>5.1 Repairs of stone, brick and block masonry (cracks, dampness, efflorescence, joint separation), flooring, roofs,<br>5.2 Concrete members (steel corrosion, lack of bond, shear, tension, compression, torsion failure),<br>5.3 Rain water leakage in buildings, basement and toilet area<br>5.4 Control of termites in building<br>5.5 Fungus decay of wood works in buildings<br>5.6 Estimation of repairs and retrofitting   | <b>09</b>        | <b>16</b>               |
| <b>Course Outcome: CEG314-6-</b> Explain demolition techniques for structures.                |  |                  |                         |
| <b>6</b>  | <b>Demolition and dismantling techniques-</b><br>6.1 Definition<br>6.2 Demolition techniques : Non-engineering (manual) demolition, engineering demolition – i) Racking ball method, pusher arm technique, thermic lance technique, non-explosive demolition,  | <b>06</b>        | <b>10</b>               |



|   |   |           |           |
|---|---|-----------|-----------|
|   | concrete sawing method vi) deliberate collapse method, vii) pressure jetting<br>6.3 Safety measures<br>6.4 Dismantling of buildings and reuse of materials from environmental and financial point of view |           |           |
|   | <b>Total</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |   |           |           |

**Specification table for setting question paper for semester end theory examination**

| Topic No. | Name of Topic                             | Distribution of Marks (Cognitive level wise) |            |           | Total Marks |
|-----------|---|--|------------|-----------|-------------|
|           |   | Remember                                     | Understand | Apply     |             |
| 1         | Maintenance of buildings                  | 02   | 04         | 06        | 12          |
| 2         | Repair strategies                         | 02   | 04         | 08        | 14          |
| 3         | Durability and serviceability of concrete | 02   | 04         | 08        | 14          |
| 4         | Materials and techniques for repair       | 02   | 04         | 10        | 14          |
| 5         | Repair, retrofitting and rehabilitation   | 02   | 04         | 06        | 16          |
| 6         | Demolition and dismantling techniques     | 02   | 04         | 06        | 10          |
|           | <b>Total</b>                              | <b>12</b>                                    | <b>22</b>  | <b>46</b> | <b>80</b>   |

**INDUSTRIAL EXPOSURE**

| SN | Mode of Exposure                     | Topic  |
|----|--------------------------------------|--|
| 1. | Field examples of course application | Topics of theory syllabus  |
| 2. | Field examples of course application | Assignment on study of professional drawings, use of software and field visits |
| 3. | Field visits                         | Reports writing work   |

**IMPLEMENTATION STRATEGY:**

**Instructional strategies:**

1. Lectures and discussions.
2. Time bound regular home assignments.
3. Industrial visits.
4. Case study.
5. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.

6. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning**.

**Suggested Micro-projects:**

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma. A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

**Teaching and Learning Resources:**

1. Chalk-board.
2. Models and Magnetic cut-outs.
3. Demonstrative charts.
4. Computer aided presentations.

**INSTRUCTIONAL STRATEGY:**

1. Lecture cum discussions.
2. Practical work.
3. Field Visits.

**Reference Books.**

| Sr No | Author                                  | Title   | Publisher   |
|-------|---|---|---|
| 01    | P.K. Guha                               | Maintenance and Repairs of Buildings                                    | New Central Book Agencies   |
| 02    | Nayak B.S.                              | Maintenance Engineering For Civil Engineers                             | Khanna Publication  |
| 03    | Hutchin Son, BD                         | Maintenance and Repairs of Buildings                                    | Newnes – Butterworth  |
| 04    | Ransom. W. H.                           | Building Failures – Diagnosis and Avoidance                             | E and F. N. Span  |
| 05    | P.S. Gaholt, Sanjay Sharma              | Building Repair and maintenance management                              | CBS Publishers and Distributors, N. Delhi                               |
| 06    | Denison Campbell allen and Harold Roper | Concrete Structures Materials, Maintenance and Repairs.                 | Longman Scientific and Technical UK 1991                                |
| 07    | Allen R.T amd Edwares S.C.              | Repair of Concrete Structures   | Blakie and Sons UK 1987   |
| 08    | Raikar R.N.                             | Learning From failures Deficiencies in Design, Construction and Service | R & D center (SDCPL) Raikar Bhavan Bombay 1987                          |
| 09    | Santhakumar A.R.                        | Concrete Technology   | Oxford University Press Printed in india bvy Radha Press New Delhi 2007 |
| 10    | Peter H Emmons                          | Concrete Repair and Maintenance IIIustrated                             | Galgotia Publications PVT.Ltd., 2001                                    |

**COURSE ID :**

**Course Name : ENERGY CONSERVATION & GREEN BUILDING CONSTRUCTION**

**Course Code : CEG315**

**Course Abbreviation : GECG**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |           | Term End Examination            |                |                             | Total      |
|-----------------------|---------------------------------------|-----------|---------------------------------|----------------|-----------------------------|------------|
|                       | Theory                                | Practical | Theory Examination              | Practical Work | Oral Examination (Internal) |            |
| Details of Evaluation | Average of two tests of 20 marks each | --        | Term End Theory Exam (03 hours) | -----          | As per Proforma-II          |            |
| Marks                 | <b>20</b>                             | --        | <b>80</b>                       | ----           | <b>25</b>                   | <b>125</b> |

**RATIONALE :**

Technological development in all sectors has caused imbalance in energy generation and it's consumption. Building heating and cooling are the most energy-intensive activities, followed by electricity use for lighting and appliances. Rising standards of living result in more energy services required for heating, cooling, lighting and communicating. Energy being in limited quantum as on date is a very scarce resource now days and need to be used optimally. Higher levels of energy efficiency reduce carbon emissions from the home's own energy systems. Therefore, it becomes necessary to be energy conscious and make every effort for the conservation of energy. Energy conservation is a scientific tool provided to minimize the energy imbalance. Green building use the resources optimally, reduce waste and reduce the cost of lifecycle and provide healthy indoor environment for its occupants through restoring/improving the natural environment. Therefore today's home buyers are interested in green building as it improve the way homes use energy, water, and materials, to reduce negative impacts on human health and the overall environment-both during construction and over its lifetime. This course will enable the student's to face these challenges of today's era in most effective way to build the structures as green one to improve the

quality of environment significantly. This is one of the rapid emerging field in the area of engineering hence this has been included as core technology subject.

### COMPETENCY

- **Implement** concept of energy conservation in construction practices and Improve the quality of environment by adopting green building construction techniques.
- Cognitive:** Understanding and applying principles of energy management and green building construction techniques to solve civil engineering problems and improve the quality of environment.
- Psychomotor :** i)Knowing operation of different equipments .ii)Identifying energy losses and wastage.
- Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation  
v) Hygiene vii) civic sense

| Competency and COs  | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|---|--|-----------------------|--------------------------------------|---|--|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b><br>Implement concept of energy conservation in construction practices and Improve the quality of environment by adopting green building construction techniques. | 3  | 3                     | 2                                    | 1   | 2  | 3                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEF315-1</b> Identify the need of Energy Conservation and understand renewable ,non renewable energy sources   | 2  | 2                     | 2                                    | 2   | 3  | 1                       | 2                       | 2                    | 2                                 | 3                             |
| <b>CEF315-2</b> Justify the need of EIA and Implement the different steps in environmental Impact assessment  | 3  | 2                     | 3                                    | 2   | 3  | 3                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEF315-3</b> Identify Energy efficiency opportunities and suggest measures for energy efficiency in building   | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEF315-4</b> Explain the principles of green building and Suggest the strategies for design of the green buildings   | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEF315-5</b> Identify the relevant Materials required for the given building to have green building construction   | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |
| <b>CEF315-6</b> Select the relevant rating system for assessment of given Green building  | 3  | 3                     | 3                                    | 3   | 2  | 1                       | 2                       | 2                    | 3                                 | 3                             |

## 2. COURSE OUTCOMES (COs)

**CEF315-1.** Identify the need of Energy Conservation and understand renewable, non renewable energy sources

**CEF315-2** Justify the need of EIA and Implement the different steps in environmental Impact Assessment.

**CEF315-3** Identify Energy efficiency opportunities and suggest measures for energy efficiency in Building

**CEF315-4** Explain the principles of Green building and Suggest the strategies for design of the green buildings

**CEF315-5** Identify the relevant Materials required for the given building to have Green building construction.

**CEF315-6** Select the relevant rating system for assessment of given Green building.

### CONTENTS :

### PRACTICALS / EXERCISE WORK-

| Sr No. | Title of Practical Exercise  | Skills / Competencies to be developed  | Course Outcome       |
|--------|--|--|----------------------|
|        | 1. Visit any building in your locality to identify there levant legal provisions followed for control of pollution and submit your observations -cum-findings in the form of a report.<br>2. Inspect your institute building and submit an action plan for improving indoor and outdoor I environmental quality<br>3. Estimate the capacity of the solar plant required for your institute building on the basis of the total electricity consumption data<br>4. Visit to any organization Where Energy Conservation program is implemented. (e.g. Hospitals, Workshops, Commercial Buildings, Residential buildings and submit your observations-cum-findings in the form of a report.<br>5. Study of different Electrical fixtures in the building to reduce energy consumption<br>6. Identify the impact of number of trees, green belt on the energy level of the building. (By physical verification)<br>7. Prepare an action plan for energy conservation by inspecting an existing structure to explore its potential in it.<br>8. Conduct the energy audit of your institute building using any rating system<br>9. Visit to the nearby wind mill and prepare a report on your | 1. Information collection and presentation in form of report<br>2. Motivation through field exposure<br>3. Presentation skills | CEF315-1 to CEF315-6 |

|   |  |  |
|---|--|--|
| <p>observations w.r.t. generation of energy with relevant sketches</p> <p>10. Visit to the near by Hydroelectric power plant and prepare are portony our observations w.r.t. generation of energy with relevant sketches wherever required.</p> <p>11.Visit to the near by solar energy plant and prepare are portony our observations w.r.t. generation of energy with relevant sketches.</p> <p>12.Inspect any conventional building in your area to suggest the action plan for converting it into green building with necessary legal provisions to be followed</p> <p>13.Visit the site for assessment of green building with relevant rating system and submit your findingsin the form of a report.</p> <p>14.Visit a building in your locality for suggesting necessary modifications required for energy conservation and improving green rating .</p> <p>Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:</p> <ol style="list-style-type: none"> <li>a. Prepare are port by taking case study to classify the terms and the construction methodologies between Traditional building and Green building.</li> <li>b. Collect the relevant information of recent technologies in green building construction and prepare a report on it.</li> <li>c. Make a model of hydro electric power plant and prepare a report.</li> <li>d. Prepare a questionnaires for environmental audit.</li> <li>e. Prepare questionnaires for assessment of environmental impact.</li> </ol> |  |  |
|---|--|--|

**CONTENT :THEORY**

**Section – I**

| Sr. No. | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---------|--|------------------|---------------------------|
|         | CEF315-1. Identify the need of Energy Conservation and understand renewable, non renewable energy sources. |                  |                           |

|  |  |           |           |
|--|--|-----------|-----------|
| 1  | <p><b>Energy sources and energy conservation</b><br/> <b>1.1 Renewable Energy Resources:</b> Solar Energy, wind Energy, Ocean Energy, Hydro Energy, Biomass Energy<br/> Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Biofuels<br/> <b>1.2 Energy conservation:</b> Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.<br/> Functions of Government organization working for Energy conservation and Audit (ECA)-<br/> National productivity council –NPC<br/> Ministry of New and Renewable energy-MNRE<br/> Bureau of energy efficiency BEE<br/> Maharashtra energy development agency MEDA</p> | 10        | 16        |
| <p>CEF 315-2 Justify the need of EIA and Implement the different steps in environmental Impact assessment assessment.</p>  |  |           |           |
| 2.   | <p><b>2.1 Environmental Audit:</b> Meaning, Necessity, Norms<br/> <b>2.2 Types:</b> Objective based types: Liabilities audit, Management audit, Activities audit<br/> <b>2.3 Client-driven types:</b> Regulatory external audit, Independent external audit, Internal environmental audit, Third party audit<br/> Environmental Impact Assessment (EIA): Introduction, EIA regulations, Steps in environmental impact assessment process, Benefits of EIA, Limitations of EIA, Environmental clearance for the civil engineering projects</p>  | 06        | 12        |
| <p><b>CEF315-3</b> Identify Energy efficiency opportunities and suggest measures for energy efficiency in building</p>   |  |           |           |
| 3  | <p><b>3.1 Energy Efficiency in building construction</b><br/> Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.</p>   | 08        | 12        |
| <b>TOTAL</b>   |  | <b>24</b> | <b>40</b> |
| <p>Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.</p> |  |           |           |

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>CEF315-4</b> Explain the principles of Green building and Suggest the strategies for design of the green buildings   |   |                  |                           |
| 4   | <b>Green Buildings</b><br>Introduction to Green Buildings: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development<br><b>Principles:</b> Principles of Green Building planning<br><b>Features:</b> Salient features of Green Building, Environmental design (ED) strategies for building construction<br>Process: Improvement in environmental quality in civil structure | 14               | 24                        |
| <b>CEF315-5</b> Identify the relevant Materials required for the given building to have green building construction   |   |                  |                           |
| 5   | <b>Building materials:</b><br><br>Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial  | 04               | 08                        |
| <b>CEF315-6</b> Select the relevant rating system for assessment of given Green building  |   |                  |                           |
| 6   | <b>Green building Rating system</b><br><br>5.2 Indian Green Building Council (IGBC)<br>IGBC Green new buildings rating systems<br>Scope and benefits of IGBC<br>Levels of certification<br><br>5.3 Green Rating for Integrated Habitat Assessment. (GRIHA) criteria   | 06               | 08                        |
| <b>TOTAL</b>  |   | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |



**Specification table for setting question paper for semester end theory examination :**

| Topic No. | Name of topic                              | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|--|--|------------|-------------|----------------|-------------|
|           |  | Remember                                     | Understand | Application |                |             |
| 1         | Energy sources and energy conservation     | 08   | 08         | --          | CEF315-1       | 16          |
| 2         | Environmental Audit                        | 02   | 04         | 06          | CEF315-2       | 12          |
| 3         | Energy Efficiency in building construction | 02   | 04         | 06          | CEF315-3       | 12          |
| 4         | Green Buildings                            | 08   | 08         | 08          | CEF315-4       | 24          |
| 5         | Building materials                         | 04   | 04         | --          | CEF315-5       | 08          |
| 6         | Green building Rating system               | 02   | 02         | 04          | CEF315-6       | 08          |
|           | <b>TOTAL</b>                               | <b>18</b>                                    | <b>26</b>  | <b>36</b>   |                | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**INDUSTRIAL EXPOSURE**

| SN | Mode of Exposure                     | Topic  |
|----|--------------------------------------|--|
| 1. | Field examples of course application | Topics of theory syllabus  |
| 2. | Field examples of course application | Assignment on study of professional drawings, use of software and field visits |
| 3. | Field visits                         | Reports writing work   |

**IMPLEMENTATION STRATEGY:**

**Instructional strategies:**

1. Lectures and discussions.
2. Time bound regular home assignments.

3. Industrial visits.
4. Case study.
5. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
6. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning**.

**Teaching and Learning Resources:**

1. Chalk-board.
2. Models and Magnetic cut-outs.
3. Demonstrative charts.
4. Computer aided presentations.

**INSTRUCTIONAL STRATEGY:**

1. Lecture cum discussions.
2. Field Visits.
3. Video films

**REFERENCE MATERIAL:**

**Books / Journals / IS Codes / Websites**

| Sr. No. | Author   | Title   | Publisher                                 |
|---------|--|---|---|
| 1.      | Kibert, C.J.   | Sustainable construction:Green Building design and Delivery                   | John Wiley<br>Hoboken ,NewJersey,         |
| 2.      | -----  | IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, | Indian Green Building Council Publishers. |
| 3.      | K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao. | Alternative Building Materials and Technologie                                | Wiley Press                               |
| 4       | G. D. Rai  | Non conventional Energy Resources   | Khanna Publishers.                        |
| 5       | Sam Kubba  | Handbook of Green Building Design and Construction                            | Butterworth hinemann                      |

**d) Websites:**

1. Website of bureau of energy and efficiency :[WWW.bee-india.nic.in](http://WWW.bee-india.nic.in)
2. Website of AkshayUrja News Bulletin : [WWW.mnes.nic.in](http://WWW.mnes.nic.in)
3. Notes on energy management on : [WWW.energymanagertraing.com](http://WWW.energymanagertraing.com)
4. WWW. Greenbusiness.com
5. WWW. Worldenergy.org
6. WWW. Mahaurga.com (For Case Studies)
7. ECBE. User Guide 2010

**LEVEL IV**

**APPLIED TECHNOLOGY**

**COURSES**

**COURSE ID:**

**Course Name : ANALYSIS OF STRUCTURES**

**Course Code : CEG401**

**Course Abbreviation : GAOS**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CEG307Mechanics of Structures**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 04      |
| Tutorial         | 01           |         |
| Practical        | -            |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                | Term End Examination            | Total      |
|-----------------------|---------------------------------------|---------------------------------|------------|
| Details of Evaluation | Average of two tests of 20 marks each | Term End Theory Exam (03 hours) |            |
| Marks                 | <b>20</b>                             | <b>80</b>                       | <b>100</b> |

**RATIONALE:**

This course is a continuation of the course Mechanics of Structures. It deals mainly with the analysis of statically indeterminate structures. Topic on slope and deflection in beams, long columns and direct and bending stresses are also included. The goal is to develop an insight for the structural behavior of members.

**COMPETENCY:**

Apply principles of structural mechanics to solve engineering problems as follows:

**Cognitive: Understanding** and applying principles of structural mechanics to engineering problems

**Psychomotor: i)** Calculating skills **ii)** plotting Mohr's circle

**Affective: Attitude** of **i)** precision **ii)** accuracy **iii)** punctuality

**COURSE OUTCOMES:**

**CEG401-1** Solve problems on perfect frames analytically and graphically

**CEG401-2** Solve problems on principal stresses analytically and graphically

**CEG401-3** Solve problems on members subjected to direct and bending stresses

**CEG401-4** Solve problems on columns

**CEG401-5** Solve problems on SFD and BMD of fixed beams and continuous beams

**CEG401-6** Determine slopes and deflections of determinate beams using Macauley's method

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:**

[**Note: Correlation levels:** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation]

| Competency and COs   | Programme Outcomes POs and PSOs               |                             |  |   |   |                               |                               |                               |  |  |
|--|---|-----------------------------|--|---|---|-------------------------------|-------------------------------|-------------------------------|--|--|
|  | PO 1<br>Basic and<br>disciplined<br>knowledge | PO 2<br>Problem<br>analysis | PO 3<br>Design<br>/development<br>of solutions | PO 4<br>Engineering<br>Tools/<br>experimentation<br>and testing | PO 5<br>The engineering<br>practice for society,<br>sustainability and<br>environment | PO 6<br>Project<br>management | PO 7<br>Life-long<br>learning | PSO1<br>Plan<br>and<br>Design | PSO2<br>Construction<br>and<br>Maintenance | PSO3<br>Problem<br>Solving<br>on field |
| <b>Competency:</b> Apply principles of structural mechanics to solve engineering problems. | 3   | 2                           | 3  | 2   | 2   | -                             | 2                             | 1                             | 1  | 2                                      |
| <b>CEG401-1</b> Solve problems on simple frames  | 2   | 2                           | 2  | 1   | -   | -                             | 2                             | 2                             | 1  | 1                                      |
| <b>CEG401-2</b> Solve problems on principal stresses analytically and graphically          | 2   | 2                           | 1  | 1   | -   | -                             | 1                             | 2                             | 1  | 1                                      |
| <b>CEG401-3</b> Solve problems on members subjected to direct and bending stresses         | 2   | 2                           | 2  | 1   | -   | -                             | 1                             | 2                             | 1  | 1                                      |
| <b>CEG401-4</b> Solve problems on long columns   | 2   | 2                           | 1  | 1   | -   | -                             | 1                             | 2                             | 1  | 1                                      |
| <b>CEG401-5</b> Solve problems on SFD and BMD of fixed beams and continuous beams          | 2   | 2                           | 2  | 1   | -   | -                             | 2                             | 2                             | 1  | 1                                      |
| <b>CEG401-6</b> Solve problems on slope and deflection of beams.                           | 2   | 2                           | 2  | 1   | -   | -                             | 1                             | 2                             | 1  | 1                                      |

**A) Theory: Section I**

| Sr. No.   | Topics  | Teaching (Hours) | Theory evaluation |
|---|---|------------------|-------------------|
| <b>Course Outcome: CEG401-1</b> Solve problems on simple frames analytically and graphically  |   | <b>08</b>        | <b>10</b>         |
| <b>1</b>  | Definition. Assumptions. Perfect, redundant and deficient frames with examples. Problems on determination of forces in members of simply supported and cantilever simple perfect frames by i) method of joints, ii) method of sections, iii) graphical method. (Problems on graphical method only in term work assignments and not in theory examination )  |                  |                   |
| <b>Course Outcome: CEG401-2</b> Solve problems on principal stresses analytically and graphically   |   | <b>06</b>        | <b>10</b>         |
| <b>2</b>  | 2.1 Definition of principal stresses and principal planes. Different states of stresses. Field examples.<br>2.2 Normal and tangential stresses on oblique planes of a body subjected to axial stresses.<br>2.3 Normal and tangential stresses on oblique planes of a body subjected to stresses acting on two mutually perpendicular planes with or without shear stress. Resultant stress on oblique plane.<br>2.4 Condition for oblique plane to be principal plane, principal stresses, location of principal planes. Maximum shear stresses and their planes.<br>2.5 Mohr's circle for stresses on oblique plane of a body subjected to various states of stresses. |                  |                   |
| <b>Course Outcome: CEG401-3</b> Solve problems on members subjected to direct and bending stresses  |   | <b>06</b>        | <b>12</b>         |
| <b>3</b>  | 3.1 . Concept of direct and eccentric loads. Field examples.<br>3.2 Tension members and short compression members subjected to eccentric loads with eccentricity about one principal axis, stress distribution at base, maximum and minimum stresses, condition for no tension middle third rule, and core of section.<br>3.3 Stress distribution at base of column, pillars and Chimneys of uniform section subjected to lateral wind pressure   |                  |                   |
| <b>Course Outcome : CEG401-4</b> Solve problems on long columns   |   |                  |                   |
| <b>4</b>  | 4.1 Definition of short and long columns. Classification and end conditions for effective length. Radius of gyration, slenderness ratio. Field examples<br>4.2 Euler's formula for long column, buckling load, safe load. Assumptions and limitations<br>4.3 Rankine's formula and its application  | <b>04</b>        | <b>08</b>         |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>         |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                   |

**Section II**

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b>Course Outcome : CEG401-5</b> Solve problems on fixed beams and continuous beams   |  |                  |                         |
| 5   | <p><b>5.1 Fixed beams:</b></p> <p>Meaning and effect of fixity of support. Field examples. Definition of fixed beam. Advantages and Disadvantages.<br/>Principle of superposition. Fixed end moments for beams of uniform section subjected to concentrated loads and uniformly distributed load over entire span. Shear force and bending moment.</p> <p><b>5.2 Continuous beams:</b></p> <p><b>5.2.1. Clapeyron's theorem of the three moment :</b></p> <p>Definition. Effect of continuity. Nature of moments induced due to continuity. Advantages and disadvantages. Field examples.<br/>Clapeyron's theorem of three moments. Application to various types of continuous beams (supports at the same level) subjected to concentrated and uniformly distributed loads over entire span.<br/>Shear force and bending moment diagrams up to two and three spans with or without over hangs</p> <p><b>5.2.2.Moment Distribution Method:</b></p> <p>Hardy cross sign convention. Carryover factor. Stiffness factor<br/>Distribution factor.<br/>Application of moment distribution to various types of continuous beams subjected to concentrated and uniformly distributed loads over entire span. Shear force and bending moment diagrams</p> | 04               | 08                      |
|   |  | 06               | 10                      |
|   |  | 06               | 10                      |
| <b>Course Outcome : CEG401-6</b> Solve problems on slope and deflection of beams  |  |                  |                         |
| 6   | <p><b>Slope and Deflection in Beams</b></p> <p>6.1 Definition of slope and deflection of beams. Radius of curvature. Relation between slope and deflection. Differential equation<br/>6.2 Macauley's method: Application to simply supported, cantilever beam subjected to concentrated and uniformly distributed loads (calculations involving solution of cubic equations are not expected)</p>  | 06               | 12                      |
| <b>Total</b>  |  | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                         |

**Specification table for setting question paper for semester end theory examination**

| Topic no. | Name of topic                  | Distribution of marks (Cognitive level wise) |            |           | Total Marks |
|-----------|--------------------------------|--|------------|-----------|-------------|
|           |                                | Remember                                     | Understand | Apply     |             |
| 1         | Simple frames                  | 02   | 04         | 04        | 10          |
| 2         | Principal Stresses and Strains | 02   | 04         | 04        | 10          |
| 3         | Direct and Bending Stresses    | 02   | 02         | 08        | 12          |
| 4         | Columns                        | 02   | 02         | 04        | 08          |
| 5         | Fixed Beams                    | 02   | 02         | 04        | 08          |
| 6         | Continuous Beams               | 02   | 06         | 12        | 20          |
| 7         | Slope and Deflection in Beams  | 02   | 04         | 06        | 12          |
|           | <b>Total</b>                   | <b>14</b>                                    | <b>24</b>  | <b>42</b> | <b>80</b>   |

**INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                     | Topic                     |
|----|--------------------------------------|---------------------------|
| 1. | Field examples of course application | Topics of theory syllabus |

**IMPLEMENTATION STRATEGY:**

**Instructional strategies:**

1. Lectures
2. Home Assignments
3. Tutorials

**Teaching and Learning resources, including references:**

1. Chalk & Black-board
2. Item banks

**Reference Books:**

| Sr. No.                      | AUTHOR                   | TITLE                                | PUBLISHER    |
|------------------------------|--------------------------|--------------------------------------|--------------|
| 1.                           | S. B. Junnurkar          | Mechanics of Structures Vol.I and II |              |
| 2.                           | S. Ramamurtham           | Theory of Structures                 | Standard     |
| 3.                           | Sunil Deo                | Mechanics of Structures              | Nirali, Pune |
| Recommended Further Readings |                          |                                      |              |
| 4.                           | V.N.Vazirani&M.M.Ratwani | Analysis of structure                |              |
| 5.                           | Timoshenku and Young     | Theory of Structure                  | TMH India    |

\* \* \*



**COURSE ID: CE**

**Course Name : DESIGN AND DRAFTING OF RCC STRUCTURES**

**Course Code : CEG402**

**Course Abbreviation : GRCC**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : CEG307 Mechanics of Structures**

**Teaching Scheme :**

| Scheme Component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 04           | 06      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                             | Total |
|-----------------------|---------------------------------------|---|---------------------------------|-----------------------------|-------|
|                       | Theory                                | Practical Work  | Theory Examination              | Oral Examination (External) |       |
| Details of Evaluation | Average of two tests of 20 marks each | 1. 25 marks for Continuous Assessment<br>2. 25 marks Progressive skill test<br>3. 25 marks Microproject | Term End Theory Exam (04 hours) | As per Proforma III         |       |
| Marks                 | 20                                    | --  | 80                              | 50E                         | 150   |

**RATIONALE :**

This course covers fundamentals of Limit State Method with reference to IS:456-2000 in order to analyze, design and draft RCC building elements like slabs, beams, columns, footings and dog-legged staircase along with exposure to ductile detailing as per IS:13920-2002. Basic knowledge of pre-stressed concrete is also included in the syllabus.

**COMPETENCY:**

Apply principles of structural design to RCC structures as follows:

**Cognitive :** Understanding and applying principles of structural mechanics to RCC structures

**Psychomotor :** i) Calculating skills ii) drafting skills

**Affective :** Attitude of i) precision ii) accuracy iii) safety iv) punctuality

**COURSE OUTCOMES:**

**CEG402-1** Draw and state functions of components of common RCC structures and prestressing

**CEG402-2** Analyze, design and draft rectangular beams

**CEG402-3** Analyze, design and draft flanged beams

**CEG402-4** Analyze, design and draft RCC members for shear, bond and torsion

**CEG402-5** Analyze, design and draft slabs

**CEG402-6** Analyze, design and draft columns and footings

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | Programme Outcomes POs and PSOs               |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|
|   | PO 1<br>Basic and<br>disciplined<br>knowledge |   | PO 1<br>Basic and<br>disciplined<br>knowledge |   | PO 1<br>Basic and<br>disciplined<br>knowledge |   | PO 1<br>Basic and<br>disciplined<br>knowledge |   | PO 1<br>Basic and<br>disciplined<br>knowledge |   |
| <b>Competency:</b> Apply principles of structural design to RCC structures  | 3   | 2 | 3   | 2 | 2   | - | 2   | 1 | 1   | 2 |
| <b>CEG402-1</b> Draw and state functions of components of common RCC structures and pre stressing and ductile detailing | 3   | 2 | 1   | 1 | 2   | 1 | 1   | 1 | 1   | 1 |
| <b>CEG402-2</b> Analyze, design and draft rectangular beams   | 3   | 2 | 1   | 2 | -   | - | 2   | 2 | 2   | 1 |
| <b>CEG402-3</b> Analyze, design and draft flanged beams   | 3   | 2 | 3   | 1 | 2   | - | 1   | 2 | 2   | 1 |
| <b>CEG402-4</b> Analyze, design and draft RCC members for shear, bond and torsion                                       | 3   | 2 | 2   | 1 | 2   | - | 2   | 2 | 2   | 1 |
| <b>CEG402-5</b> Analyze, design and draft slabs   | 3   | 2 | 2   | 1 | 1   | - | 2   | 2 | 2   | 1 |
| <b>CEG402-6</b> Analyze, design and draft columns and footings  | 3   | 2 | 1   | 1 | 1   | - | 1   | 2 | 2   | 1 |

**CONTENTS :**

**A) PRACTICAL WORK**

The Practical work shall consist of the following :

|   |   |                       |
|---|---|-----------------------|
| a) For a simple plan of a G + 2 residential building based on the contents taught in the theory. Students should be encouraged to prepare their own architectural plan otherwise teacher will provide separate data of plan, dimensions and material grades separate for separate groups or batches of students; maximum batch size not exceeding 20. A | Mini project on structural design of G+2 framed residential building  |                       |
| 1   | Preparation of plan / drawing with one cantilever beam,<br>Simply supported beam, overhang Beam, primary secondary beams  |                       |
| 2   | Load calculation  | CEG402-2 ,CEG402-5    |
| 3.  | Design of slabs   | CEG402-5              |
| 4   | Design of beams, staircase  | CEG402-2              |
| 5   | Design of columns and footings  | CEG402-6              |
| b)  | full imperial size drawing sheets finished in pencils containing:<br>beam and slab, staircase schedule of reinforcements with ductile detailing and notes   | CEG402-2, CEG402-5    |
|   | full imperial size drawing sheets finished in pencils containing:<br>beam, beam column joint, Column and column footing with ductile detailing and notes  | CEG402-1,CEG402-6,    |
| c)  | Field visit: any one<br>i) construction sites to study reinforcement details and concreting of slabs, beams, column and footings<br>ii) construction site of pile foundation<br>iii) Construction site of prestressed concrete. | CEG402-1 to CEG402-6, |

**B) i) Micro-projects:** Micro-projects in groups of 5/6 students with presentation on any one of the following

- 1) Collect professional drawing of any structure and prepare report for reinforcement for Different components.
- 2) Collect information of drawing and design of formwork and prepare report.
- 3) Collect drawing and design procedure for elevated service reservoir.
- 4) Collect drawing and design procedure for ground service reservoir.
- 5) Collect drawing and design procedure for retaining wall
- 6) Visit to site and prepare report for labour management for any one activity related to RCC components
- 7) Visit to site and check level for slab, plumb of column and depth of column as per drawing and prepare report.
- 8) Collect the safety norms during RCC constructions and prepare a report.
- 9) Visit to the site at the time of removal of formwork and prepare a report.
- 10) Study of software packages used for design and drafting of steel structures.

## **B) INDUSTRIAL EXPOSURE**

| <b>SN</b> | <b>Mode of Exposure</b>              | <b>Topic</b>  |
|-----------|--------------------------------------|---|
| 1.        | Field examples of course application | Topics of theory syllabus   |
| 2.        | Field examples of course application | Practical work assignment on study of professional drawings, use of software and field visits |
| 3.        | Field visits                         | Practical work  |

### **Assessment Criteria for Term End Oral Examination:**

At least two questions, based on term work produced by the candidate, each of knowledge level, comprehension and application level shall be asked by the examiner during the oral examination.

D) THOERY

Section I

| Sr.No.   | Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>Course Outcome : CEG402-1</b> Draw and state functions of components of common RCC structures and pre-stressed concrete |  |                  |                           |
| 1.   | <p><b>Overview of RCC Structures and Introduction to Limit State Method</b></p> <p><b>1.1 Introduction to Limit State Method: ...(04 marks)</b><br/>Definition of RCC, functions of reinforcement, material properties, use of IS:456-2000. Definition and types of limit states, partial safety factors for material strength, characteristic strength. Types of loads, use of IS:875-1987, characteristic load, design load. Quality control and professional ethics.</p> <p><b>1.2 Overview of RCC Structures : ...(04 marks)</b><br/>Buildings : Structural and nonstructural components<br/>Water Tanks : Components and typical reinforcement of GSR (with flexible / rigid base) and Intze tank<br/>Retaining Walls : Types. Typical reinforcement detailing of T-shaped cantilever retaining wall</p> <p><b>1.3 Seismicity and Ductile Detailing ...(04 marks)</b><br/>Definition, magnitude and intensity of earthquake. Zones. Damages like bond failure, shear, cracking, slab tearing. Remedies. Ductile Detailing Provisions in IS:13920-2000</p> <p><b>1.4 Introduction to Prestressed Concrete ...(04 marks)</b><br/>Meaning of prestressed concrete, comparison with RCC. Advantages and disadvantages of prestressed concrete. Methods of prestressing, pretensioning and post-tensioning<br/>Losses of prestress : meaning and list of losses.(<i>No problems</i>)</p> | 10               | 16                        |
| <b>Course Outcome : CEG402-2</b> Analyze, design and draft rectangular beams   |  |                  |                           |
| 2  | <p><b>Flexural Analysis and Design of Rectangular Beams</b></p> <p><b>2.5 Singly Reinforced Rectangular Beams ...(08 marks)</b></p> <p>2.5.1 Limit State of collapse (flexure) : assumptions, stress-strain relationship for concrete and steel, strain diagram and stress block diagram for singly reinforced section, design parameters and constants, ultimate moment of resistance</p> <p>2.5.2 Under- reinforced, over-reinforced and balanced sections : meaning and comparison</p> <p>2.5.3 Flexural analysis and design : Numerical problems on</p>  | 14               | 16                        |

| Sr.No.  | Topics  | Teaching (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
|   | <p>determination of design constants, ultimate moment of resistance, ultimate load carrying capacity, design of balanced and under-reinforced sections</p> <p>2.5.4 IS specifications regarding spacing, cover, minimum reinforcement, effective span, etc. in beams</p> <p><b>2.6 Doubly Reinforced Rectangular Beams ... (8 marks)</b></p> <p>2.6.1 Meaning and conditions for providing doubly reinforced beams</p> <p>2.6.2 Flexural analysis of doubly reinforced sections: strain and stress diagrams, numerical problems on ultimate moment of resistance</p> <p>2.6.3 Design of doubly reinforced sections: Numerical problems on balanced design</p> |                  |                           |
| <b>Course Outcome : CEG402-3</b> Analyze, design and draft flanged beams  |   |                  |                           |
| <b>3</b>  | <p><b>Flexural Analysis and Design of Flanged Beams</b></p> <p>3.1 Meaning and conditions for formation of flanged (T and L) beams, comparison with rectangular beams, effective width of flange</p> <p>3.2 Analysis of singly reinforced flanged beams: Introduction to cases of neutral axis in i) flange and ii) web. Detailed analysis and numerical problems for the case of neutral axis in the flange only</p> <p>3.3 Design of singly reinforced flanged beams : Numerical problems considering loads from supported slabs, walls and secondary beams for simple plans</p>  | <b>08</b>        | <b>08</b>                 |
| <b>Total</b>  |   | <b>32</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |   |                  |                           |

### Section II

| Sr. no.  | Topics | Teaching (Hours) | Theory evaluation Marks |
|--|--------|------------------|-------------------------|
| <b>Course Outcome : CEG402-4</b> Analyze, design and draft RCC members for shear, bond and torsion |        |                  |                         |

|   |  |    |    |
|---|--|----|----|
| 4   | <p><b>Shear, Bond and Torsion</b></p> <p><b>4.1 Shear : ... (08 marks)</b><br/>Behaviour of RCC beams and slabs in shear. IS code specifications. Various forms of shear reinforcement in beams. Use of bent up bars. Zones of minimum shear reinforcement. Numerical problems on design of beams for shear</p> <p><b>4.2 Bond : ... (04 marks)</b><br/>Meaning of bond in RCC. IS code provisions. Definition and calculation development length in tension and compression. Check for bond for simply supported and cantilever beams and slabs</p> <p><b>4.3 Torsion : ... (04 marks)</b><br/>Behaviour of RCC members in torsion with examples. IS:456-2000 provisions for torsion. No numerical problems.</p>                          | 12 | 16 |
| <b>Course Outcome : CEG402-5</b> Analyze, design and draft slabs                |  |    |    |
| 5   | <p><b>Design of Slabs</b></p> <p>5.7 Definition and classification of slabs as one-way and two-way slabs, support conditions, main and distribution steel, I.S. specifications regarding spacing and cover for reinforcement, effective span, minimum reinforcement</p> <p>5.8 Limit state of serviceability for slabs : check for deflection</p> <p>5.9 Design of slabs : Procedure and numerical problems on design of one-way simply supported slabs, cantilever slabs, two-way simply supported slabs with corners free to lift and waist slab of dog-legged staircase</p> <p>5.10 Introduction to continuous one-way and two-way slabs : Meaning, advantages and typical reinforcement detailing diagrams (No numerical problems)</p> | 12 | 12 |
| <b>Course Outcome : CEG402-6</b> Analyze, design and draft columns and footings |  |    |    |
| 6   | <p><b>Design of Columns and Footings</b></p> <p><b>6.5 Axially Loaded Short Columns ... (06 marks)</b></p> <p>6.5.1 Limit state of collapse in compression : assumptions, minimum eccentricity, slenderness ratio, short and long columns, calculation of ultimate load carrying capacity of axially loaded short rectangular and circular columns</p> <p>6.5.2 Load analysis for a column : calculation of load on an axially loaded column from beams at a floor and at various floor levels in a building</p> <p>6.5.3 Design of axially loaded short rectangular and circular columns : problems on design as per IS specifications for minimum and maximum reinforcement, transverse reinforcement, cover, etc.</p>                   | 08 | 12 |

|   |           |           |
|---|-----------|-----------|
| 6.5.4 Reinforcement detailing at the floor to floor joints  |           |           |
| <b>6.2 Axially Loaded Footings ... (06 marks)</b>   |           |           |
| 6.2.1 Introduction to various types of RCC footings : isolated stepped and sloped footings, combined footings, piles  |           |           |
| 6.2.2 Design of isolated square sloped footing : Flexural design with checks for one-way & two-way shear, bond  |           |           |
| 6.2.3 Introduction of piles : Suitability, components and behaviour (no numerical problems)   |           |           |
| <b>Total</b>  | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |           |           |

**Specification table for setting question paper for semester end theory examination**

| Topic No. | Name of Topic   | Distribution of Marks (Cognitive level wise) |            |           | Total Marks |
|-----------|---|--|------------|-----------|-------------|
|           |   | Remember                                     | Understand | Apply     |             |
| 1         | Overview of RCC Structures and Introduction to Limit State Method | 02   | 06         | 08        | 16          |
| 2         | Flexural Analysis and Design of Rectangular Beams                 | 02   | 04         | 10        | 16          |
| 3         | Flexural Analysis and Design of Flanged Beams                     | 00   | 00         | 08        | 08          |
| 4         | Shear, Bond and Torsion   | 04   | 04         | 08        | 16          |
| 5         | Design of Slabs   | 02   | 02         | 08        | 12          |
| 6         | Design of Columns and Footings                                    | 02   | 02         | 08        | 12          |
|           | <b>Total</b>  | <b>12</b>                                    | <b>18</b>  | <b>50</b> | <b>80</b>   |

**IMPLEMENTATION STRATEGY:**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Field Visit



4. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
5. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

**Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assigned to him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL:**

**a) Books / Journals / IS Codes**

| Sr. No. | Author                       | Title   | Publisher                       |
|---------|------------------------------|---|---------------------------------|
| 1.      | Dr.V.L.Shah & Dr.S.R.Karve   | Limit State Theory and Design of Reinforced Concrete Structures | Structures Publications, Pune   |
| 2.      | N.C.Sinha & S.K.Roy          | Fundamentals of Reinforced Concrete                             | S.Chand & Co., New Delhi        |
| 3.      | N.Krishna Raju & R.N.Pranesh | Reinforced Concrete Design Principles and Practice              | New Age International, Mumbai   |
| 4.      | S.U.Pillai & Devdas Menon    | Reinforced concrete Design                                      | Tata Mcgraw Hill                |
| 5.      | P. C.Varghase                | Limit State Design of Reinforced Concrete                       | Prentice Hall of India,         |
| 6.      | N.Krishna Raju               | Prestressed Concrete  | Tata McGraw Hill, Mumbai        |
| 7.      | T.Y.Lin                      | Design of Prestressed Concrete Structures                       | Wiley India                     |
| 8.      | David Dowrick                | Earthquake Resistant Design and Risk Reduction                  | Wiley India Pvt.Ltd., New Delhi |
| 9.      | Steven L. Kramer             | Geotechnical Earthquake Engineering                             | Pearson Education               |

**b) I.S. Codes :**

1. IS 456:2000 - Plain and Reinforced concrete code of Practice
2. SP16- Design Aids for reinforced concrete to IS 456
3. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.
4. SP 24 - Explanatory Handbook on IS 456
5. IS 1343-1980 - Indian Standard code of (Reaffirmed 1990) Practice for Prestressed concrete.
6. SP34 : 1987 - Handbook on concrete reinforcement and Detailing.
7. IS 13920-1993 Ductile Detailing of R. C. Building subjected to Seismic forces.

**c) Websites :**

1. [www.iitk.ac.in/nicee/IITK-GSDMA/EQ22.pdf](http://www.iitk.ac.in/nicee/IITK-GSDMA/EQ22.pdf)
2. *en.wikipedia.org/wiki/Intze\_Principle*
3. *en.wikipedia.org/wiki/Reinforced\_concrete*

**COURSE ID :**

**Course Name : DESIGN AND DRAFTING OF STEEL STRUCTURES**  
**Course Code : CEG403**  
**Course Abbreviation : GDSS**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : CEG307 Mechanics of Structures**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                    | Total |
|-----------------------|---------------------------------------|---|---------------------------------|--------------------|-------|
|                       | Theory                                | Term work   | Theory Examination              | Oral (Internal)    |       |
| Details of Evaluation | Average of two tests of 20 marks each | 1. 25 marks for Continuous Assessment<br>2. 25 marks Progressive skill test<br>3. 25 marks for microproject | Term End Theory Exam (03 hours) | As per Proforma IV |       |
| Marks                 | 20                                    | --  | 80                              | 50 I               | 150   |

**RATIONALE:**

Steel structures are one of the important engineering structures. This subject deals with the study of basic principles involved in the design of steel structures. The study is to be done with reference to IS:800-2007 and other relevant IS codes.

**COMPETENCY:**

Apply principles of structural design to steel structures as follows:

**Cognitive:** Understanding and applying principles of structural mechanics to engineering problems

**Psychomotor :** i) Calculating skills ii) drafting

**Affective :** Attitude of i) precision ii) accuracy iii) safety iv) punctuality

**COURSE OUTCOMES:**

**CEG403-1** State types and loads on steel structures and relevant IS Codes provisions

**CEG403-2** Design and draft simple bolted and welded connections

**CEG403-3** Analyze and design axially loaded tension members and compression members

**CEG403-4** Analyze and design beams

**CEG403-5** Analyze and design column bases

**CEG403-6** Design and draft a roof truss system

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs   | Programme Outcomes POs and PSOs         |                          |  |   |  |                            |                            |                         |                                      |                                  |
|--|---|--------------------------|--|---|--|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|  | PO 1<br>Basic and disciplined knowledge | PO 2<br>Problem analysis | PO 3<br>Design /development of solutions | PO 4<br>Engineering Tools/experimentation and testing | PO 5<br>The engineering practice for society, Sustainability and environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of structural design to solve engineering problems     | 3                                       | 2                        | 3  | 1   | 2  | 1                          | 2                          | 2                       | 1                                    | 1                                |
| <b>CEG403-1</b> State types and loads on steel structures and relevant IS Codes provisions | 2                                       | 1                        | 1  | 1   | -  | -                          | 2                          | 2                       | 1                                    | 1                                |
| <b>CEG403-2</b> Design and draft simple bolted and welded connections                      | 2                                       | 2                        | 1  | 1   | 1  | -                          | 2                          | 2                       | 1                                    | 1                                |
| <b>CEG403-3</b> Analyze and design axially loaded tension members and compression members  | 2                                       | 2                        | 2  | 1   | 1  | -                          | 2                          | 2                       | 1                                    | 1                                |
| <b>CEG403-4</b> Analyze and design beams   | 2                                       | 2                        | 2  | 1   | 1  | -                          | 2                          | 2                       | 1                                    | 1                                |
| <b>CEG403-5</b> Analyze and design column bases  | 2                                       | 2                        | 2  | 1   | 1  | -                          | 2                          | 2                       | 1                                    | 1                                |
| <b>CEG403-6</b> Design and draft a roof truss system                                       | 2                                       | 2                        | 2  | 1   | 1  | -                          | 2                          | 2                       | 1                                    | 1                                |

## CONTENTS :

### A) PRACTICAL WORK

The practical work shall consist of the following:

- a) **Design of a roof truss:** Complete design of a roof truss as per the data given by teacher. Calculations shall be submitted in the form of *Manual for Design of Steel Structures* developed by the Institute.
- b) **Working drawings:** Two full imperial drawing sheets showing details of graphical calculation of member forces of roof truss, sectional details, Joint details and purlin details as designed above.
- c) **Field Visits:** Field visits to
  - i) steel yard in the city to study various steel sections available in market,
  - ii) Visit to rolling mill.

### B) Micro projects:

One micro project for the group of 4/5 students

- 1) Collect professional working drawings of steel structures and prepare report.
- 2) Collect safety measures used for steel construction prepare report.
- 3) Collect photographs of different connections in steel structures.
- 4) Study of professional software packages and prepare report
- 5) Collect information of design of tower and prepare report.
- 6) Collect information of design of gantry Girder and prepare report.
- 7) Collect information of welding of steel and prepare a report
- 8) Collect information of bolted connection and prepare a report.
- 9) Collect information of design of industrial building
- 10) Collect information of estimation of any one steel structure and prepare a report.
- 11) Steel construction site to study erection of a steel structure
- 12) Collect photographs of various steel structures and prepare a chart/report.
- 13) Collect information of instruments and equipment required for steel str. Construction and verify it with a fabrication workshop.

### C) INDUSTRIAL EXPOSURE

| SN | Mode of Exposure                     | Topic  |
|----|--------------------------------------|--|
| 1. | Field examples of course application | Topics of theory syllabus  |
| 2. | Field examples of course application | assignment on study of professional drawings, use of software and field visits |
| 3. | Field visits                         | Manual   |

### Assessment Criteria for Term End Oral Examination:

At least two questions, based on term work produced by the candidate, each of knowledge level, comprehension and application level shall be asked by the examiner during the oral examination.

**D) THEORY**

**Section I**

| Sr. no.  | Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| 1  | <p><b>Course Outcome :CEG403-1</b> State types and loads on steel structures and relevant IS Codes provisions</p> <p><b>Introduction and Load Analysis</b></p> <p>1.1 Introduction to various types of steel structures like transmission towers, gantry girder, storage tanks, steel bridges etc.</p> <p>1.2 Advantages and disadvantages of steel structures.</p> <p>1.3 Physical and mechanical properties of structural steel. Stress-strain curve and its salient features</p> <p>1.4 Properties of steel structures and different type of standard steel sections available like angle, channel, I sections. Use of Steel Tables for sectional properties.</p> <p>1.5 Dead loads - estimation of dead loads of different components of structures like Roofing materials, purlins, trusses, floors etc.</p> <p>1.6 Live loads for roof trusses, floors of building</p> <p>1.7 Wind load analysis for roof trusses. (As per IS:875–1987 or the latest version )</p> <p>1.8 Limit State Method : Definition, meaning and types of limit states. Classification of cross sections as plastic, compact, semi compact and slender as per IS:800-2007</p> <p>1.9 Quality control and professional ethics</p> | 07               | 10                        |
| Course Outcome :CEG403-2 <b>Design and draft simple bolted and welded connections</b>              |  |                  |                           |
| 2  | <p><b>Connections</b></p> <p>2.1 <b>Types of connections</b> : Hinged, rigid and semi-rigid connections. Riveted, bolted and welded connections and their comparison. Lap and butt joints.</p> <p>2.2 <b>Bolted connections</b> : gross and net cross-sectional area, pitch, spacing, end and edge distances, hole diameter, nominal diameter. IS specifications. Modes of failure and capacity in single and double shear, tension and bearing. Design strength.<br/>Design of bolted connection for single or double angle members in axial tension or compression</p> <p>2.3 <b>Welded connections</b> : Fillet and butt welds. End returns, size, throat thickness, effective length of weld. Design of fillet Welded connection for single or double angle tension and compression</p> <p>2.4 Drawing of Beam to beam, beam to column, roof truss joints connections (No problems)</p>  | 05               | 10                        |
| Course Outcome :CEG403-3 Analyze and design axially loaded tension members and compression members |  |                  |                           |

| Sr. no.   | Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| 3   | <b>Tension Members and Compression Members</b><br><b>3.1 Tension Members :</b> Types of sections used.<br>Design strength governed by yielding of section, rupture of net cross-section and block shear.<br>Analysis and design of axially loaded single angle and double angle tension members with bolted and welded connections   | <b>06</b>        | <b>10</b>                 |
|   | <b>3.2 Compression Members :</b><br>Standard cases of end conditions, effective length, slenderness ratio. Design compressive stress.<br>Analysis and design of axially loaded continuous angle struts connected by bolted and welded connections with gusset plate. Limits of width to thickness ratios to prevent local buckling.<br>Compound Columns : Meaning and diagrams of simple and built-up sections (two angles, two I-sections, two channels placed back to back and toe to toe). No numerical problems.<br>Lacing and battening : Meaning and purpose. Diagrams of single and double lacing and battening system. No design | <b>06</b>        | <b>10</b>                 |
| <b>Total</b>  |  | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |  |                  |                           |

### Section II

| Sr. no. | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---------|--|------------------|-------------------------|
| 4       | <b>Course Outcome :CEG403-4 Analyze and design beams</b><br><hr/> <b>Beams</b><br>4.1 Types of steel beams. Arrangement of main and secondary beams. Common sections used for simple and compound beams<br><br>4.2 Flexural analysis and design of laterally supported simple beams subjected to uniformly distributed load. Check for shear and deflection<br><br>4.3 Plate Girder : Meaning and purpose. Diagrams of typical cross sections of bolted and welded plate girder. Diagrams showing components of plate girder. No numerical problems. | <b>10</b>        | <b>16</b>               |

|   |   |           |           |
|---|---|-----------|-----------|
| <b>5</b>  | <b>Course Outcome :CEG403-5 Analyze and design column bases</b>   | <b>05</b> | <b>08</b> |
|   | <b>Column Bases</b><br>5.1 Purpose and types of foundation.<br>5.2 Design of slab base for axially loaded columns<br>5.3 Concept and diagram of Gusseted base (No design)   |           |           |
| <b>6</b>  | <b>Course Outcome :CEG404-6 Design and draft a roof truss system</b>  | <b>09</b> | <b>16</b> |
|   | <b>Roof Trusses</b><br>6.1 Types of roof trusses and their suitability<br>6.2 Load analysis for roof truss: Dead load, Live load, Wind load analysis as per IS:875-1987 or the latest<br>6.3 Graphical method for determination of forces in members of truss (no problems in theory examination)<br>6.4 Design of purlins<br>6.5 Design of roof truss members<br>6.6 Tubular Structures : Advantages and disadvantages |           |           |
| <b>Total</b>  |   | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |   |           |           |

**Specification table for setting question paper for semester end theory examination**

| Topic No.    | Name of Topic                           | Distribution of Marks (Cognitive level wise) |            |           | Total Marks |
|--------------|---|--|------------|-----------|-------------|
|              |   | Remember                                     | Understand | Apply     |             |
| 1            | Introduction and Load Analysis          | 02   | 02         | 04        | 08          |
| 2            | Connections                             | 02   | 02         | 06        | 10          |
| 3            | Tension Members and Compression Members | 04   | 06         | 10        | 20          |
| 4            | Beams                                   | 02   | 02         | 06        | 10          |
| 5            | Column Bases                            | 02   | 04         | 10        | 16          |
| 6            | Roof Trusses                            | 02   | 04         | 10        | 16          |
| <b>Total</b> |   | <b>14</b>                                    | <b>20</b>  | <b>46</b> | <b>80</b>   |

**IMPLEMENTATION STRATEGY:**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices



3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.

4. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

#### **Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assigned to him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

#### **Teaching and Learning Resources:**

1. Chalk-board
2. Models and Magnetic cut-outs
3. Demonstrative charts
4. Computer aided presentations

#### **REFERENCE MATERIAL :**

##### **d) Reference Books:**

| Sr. No. | Author                          | Title   | Publisher                     |
|---------|---------------------------------|---|-------------------------------|
| 1       | Dr.V.L.Shah and Mrs. Veena Gore | Limit State Design of Steel Structures            | Structures Publications, Pune |
| 2       | Dr. M. R. Shiyekar              | Limit state design of steel structures            | PHI Learning                  |
| 3       | P Dayarathnam                   | Design of steel structures                        | S. Chand and Company          |
| 4       | Ghose                           | Analysis and Design practices of Steel Structures | PHI Learning                  |
| 5       | Sairam                          | Design of steel structures                        | Pearson publication.          |

##### **b) Websites :**

- i) <http://www.youtube.com/watch?v=A-bSXOdyPXs>
- ii) <http://www.youtube.com/watch?v=MRPzqvptQeQ>
- iii) [http://www.youtube.com/watch?v=61xR\\_KQa8tk&list=PLEFVu8KtgUdSVDyOzEWk\\_eVBIHV8Us7Ua](http://www.youtube.com/watch?v=61xR_KQa8tk&list=PLEFVu8KtgUdSVDyOzEWk_eVBIHV8Us7Ua)

\* \* \*

**COURSE ID :**

**Course Name** : **Estimating and Costing.**  
**Course Code** : **CEG404**  
**Course Abbreviation** : **GEAC**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s)** : **CEG303 GBDR**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 4            | 8       |
| Practical        | 4            |         |

**Evaluation Scheme:**

| Component | Progressive Assessment   |                        | Semester end Examination |                         |       |
|-----------|--------------------------|------------------------|--------------------------|-------------------------|-------|
|           | Theory                   | Practical              | Theory                   | Oral **                 | Total |
| Duration  | Two tests (1½ hour each) | Skill test of 25 marks | One paper (4 hours)      | Based on practical work |       |
| Marks     | 20                       | ---                    | 80                       | 75 E                    | 150   |

\*\* (To be assessed by internal and external examiner as per **proforma III**)

**Rationale:**

Calculation of quantities and cost estimates for civil engineering works is one of the major functions for the civil engineer and he has to acquire the knowledge of calculating the quantities of each item of work from available drawings & to prepare the estimate of the work which is necessary for allocation of funds for the required purpose and further continue to execute the work as per the drawings and estimates. The ability of recording measurements for various items of work from drawings, finding rates for different items using schedule of rates and preparing the abstract constitutes the important step in the preparation of estimate.

This subject also has a strong linkage with proper supervision of construction work mainly because of its relation to work specifications and planning and execution of site activities like stacking of materials, ordering of equipment and materials, arranging for skilled and semiskilled laborers needed on site, preparing bills for payment of work already completed etc. For proper competence in this subject, one has to be skilled in reading and interpretation of drawings and also taking measurements of completed items. The subject of Estimating and costing is therefore very important as far as its strong relevance to the actual job of a site supervisor/engineer is concerned.

## COMPETENCY

Apply principles of estimating and costing to prepare estimates of civil engineering works.

**Cognitive :**Understanding and applying principles of estimating and costing to civil engineering problems.

**Psychomotor :**i) Reading drawings and designs of civil engineering works. ii) Preparing measurement sheets and abstract sheets.

**Affective :**Attitude of i) precision ii) reliability iii) economy iv) punctuality v) aesthetic presentation vi) sense of social responsibility vii) organization.

## COURSE OUTCOMES:

CEG404-1.Understand P.W.D. procedures & mode of measurements as per IS-1200

Understand the methods and procedures of approximate estimates

CEG404-2. Understand the methods and procedures of detailed estimates.

CEG404-3.Calculate quantities of various items of buildings/other structures and prepare the abstract.

CEG404-4.Draft detailed specifications for the items of civil engineering works.

CEG404-5.Prepare Rate Analysis for the items of civil engineering works.

CEG404-6.Calculate quantities of earthwork and prepare detailed estimate of road.

## COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation

| Competency and COs  | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|---|---|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> Apply principles of Estimating & Costing to solve engineering problems   | 3   | 3                     | 2                                    | 2   | 1   | 1                       | 1                       | 1                    | 1                                 | 2                             |
| <b>CEG404-1.</b> Understand P.W.D. procedures and mode of measurements as per IS-1200. Understand the methods and procedures of approximate estimates | 3   | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 2                             |
| <b>CEG404-2.</b> Understand the methods and procedures of detailed estimates. .   | 3   | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 1                             |
| <b>CEG404-3.</b> Calculate quantities of various items of buildings and prepare the abstract  | 3   | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 3                             |
| <b>CEG405-4 .</b> Draft detailed specifications for the items of civil engineering works.   | 3   | 3                     | 2                                    | 2   | 3   | 2                       | 1                       | 2                    | 1                                 | 3                             |
| <b>CEG404-5.</b> Prepare Rate Analysis for the items of civil engineering works.  | 3   | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 1                             |
| <b>CEG404-6.</b> Calculate quantities of earthwork and prepare detailed estimate of road  |   |                       |                                      |   |   |                         |                         |                      |                                   |                               |

**PRACTICALS:**

**Practical Exercises and related skills to be developed :**

The following practical exercises shall be conducted as practical sessions of batches of about 20 students :

| Sr No. | Title of Practical   | Skills / Competencies to be developed  | Course Outcome |
|--------|--|--|----------------|
| 1      | Preparing checklist of Items of following civil engineering works (Any three). <ul style="list-style-type: none"> <li>• Load bearing building</li> <li>• Framed structure building</li> <li>• Water bound Macadam road</li> <li>• Septic tank</li> <li>• Community well</li> </ul>     | 1. Information collection and presentation in form of report   | CEG404-1       |
| 2      | Writing the rules of deduction for below mentioned items of work as per IS: 1200 <ul style="list-style-type: none"> <li>• Brick/ Stone Masonry</li> <li>• Plastering/ Pointing</li> </ul> Painting of doors & windows & grill work   | 1. Self learning ability using IS-1200.<br>2. Presentation skills  | CEG404-1       |
| 3      | Writing detailed specification for one important item of work for each of the following fields. <ul style="list-style-type: none"> <li>• Building construction</li> <li>• Irrigation engineering</li> <li>• Transportation engineering</li> <li>• Environmental engineering</li> </ul> | 1. Self learning ability using reference books and P.W.D. handbook.<br>3. Presentation skills  | CEG404-4       |
| 4      | Rate Analysis for the following <ul style="list-style-type: none"> <li>• Building - any Two items</li> <li>• Roads - any one item</li> <li>• Water Supply/Drainage work - any one item</li> </ul>  | 1.Information collection and presentation<br>2.Motivation through field exposure<br>3.Self learning ability using laboratory manual<br>4.Applying concepts studied | CEG404-5       |
| 5      | Taking of quantities of following items for small R.C.C. Hall <ul style="list-style-type: none"> <li>• Concreting for Footing,</li> </ul>  | 1.Information collection and presentation<br>2.Self learning ability using   | CEG404-3       |

|   |  |   |          |
|---|--|---|----------|
|   | <p>Column, Beam, Slab</p> <ul style="list-style-type: none"> <li>• Reinforcement for above items by preparing schedule of bars</li> <li>• Form work for all above items</li> </ul>   | <p>D.S.R. prepared by P.W.D.<br/>         3.Applying concepts studied<br/>         4.Presentation skills</p>  |          |
| 6 | <p>Preparing detailed Estimate of a Load bearing residential building for all items of work of ground floor only.</p>  | <p>1.Information collection and presentation<br/>         2.Self learning ability using D.S.R. prepared by P.W.D.<br/>         3.Applying concepts studied<br/>         4.Presentation skills</p> | CEG404-3 |
| 7 | <p>Taking Measurements on site and Preparing Bill of Quantities</p>  | <p>1.Information collection and presentation<br/>         2.Self learning ability using D.S.R. prepared by P.W.D.<br/>         3.Applying concepts studied<br/>         4.Presentation skills</p> | CEG404-3 |
| 8 | <p>Detailed Estimate of any two of the following</p> <ul style="list-style-type: none"> <li>• Septic tank.</li> <li>• Community well.</li> <li>• Pipe or slab culvert.</li> <li>• Canal earth work.</li> <li>• Water-supply from overhead tank to bath, W.C., basin, sink, geyser.</li> <li>• Estimate of Plumbing work from W.C., Bath connection to Public Sewer/ Septic Tank</li> </ul> | <p>1.Information collection and presentation<br/>         2.Self learning ability using D.S.R. prepared by P.W.D.<br/>         3.Applying concepts studied<br/>         4.Presentation skills</p> | CEG404-3 |
| 9 | <p>Detailed estimate of a new road including computation of earth work.<br/>         Introduction to software, related to quantity calculation, rate analysis and estimation.<br/>         (Optional)</p>  | <p>1.Information collection and presentation<br/>         2.Self learning ability using D.S.R. prepared by P.W.D.<br/>         3.Applying concepts studied<br/>         4.Presentation skills</p> | CEG404-6 |

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**Suggested Micro-Projects:**

1. Prepare approximate estimate of different types of buildings such as School building, Hostel, Hospital, Irrigation project etc in the nearby area.
2. Prepare detailed estimate of any load bearing structure using a software.
3. Prepare detailed estimate of any framed structure using a software.
4. Prepare Bill of quantities for a building under construction near the campus.
5. Prepare rate analysis of painting work using different types of paints & compare the rates.
6. Prepare detailed estimate for a proposed Bituminous road for 1 Km.
7. Prepare detailed estimate for the construction of Pipe culvert/ Slab culvert.
8. Prepare detailed estimate for water supply fittings from overhead tank to kitchen, bath, WC, basin , geyser etc.
9. Prepare the report on the provisions made in IS:1200 w.r.t. any one type of building.

**Note:** At least one micro-project shall be done by each group.

**Group of 2-3 students shall be made.**

**Similar assignments shall be given as miro-projects.**

**INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure                    | Topic   |
|----|-------------------------------------|---|
| 1. | Field Visits                        | Chapter ,3,4,5 of theory syllabus   |
| 2. | Collecting data for assignment work | Rates of the items, materials, wages of labourers, hire charges of equipment. |

**ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION**

**Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted.

**Oral Examination:** Oral examination shall be conducted based on the practicals & document prepared by students, by both Internal & External Examiners as per proforma III.

**H) Assessment Criteria for Practical Assignments. :**

**Continuous Assessment of Practical Assignments :** Every practical assignment shall be assessed for 25 marks as per following criteria:

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**CONTENTS:  
THEORY:**

**Section I**

| Sr. no.  | Topics   | Teaching (Hours) | Theory evaluation Marks |
|--|--|------------------|-------------------------|
| <b>COURSE OUTCOME CEG404-1.</b> Understand P.W.D. procedures and mode of measurements as per IS-1200 Understand the methods and procedures of approximate estimates. |  |                  |                         |
| <b>1</b>   | <p><b>Introduction</b></p> <p>1.1 Meaning of the terms estimating and costing</p> <p>1.2 Purpose of estimating and costing</p> <p>1.3 Meaning of check list. Purpose of check list and Check list of items of civil engineering structures</p> <p>1.4 Modes of measurements of items of work as per P.W.D and IS: 1200. Desired accuracy in taking measurements.</p> <p>1.5 District schedule of rates (D.S.R.), definition and use.</p> <p><b>Approximate Estimates</b></p> <p>1.6 Definition and purpose of approximate estimates</p> <p><b>1.7</b> Methods of approximate estimates used for buildings, Plinth area or Square meter method, Cubic meter method, Approximate quantity method, Service unit method and typical bay method.</p> <p>1.8 Methods of approximate estimates used for Roads, Bridges, Railways, Water Supply and Irrigation projects.</p> | <b>12</b>        | <b>12</b>               |

| <b>COURSE OUTCOME CEG404-2. Understand the methods and procedures of detailed estimates.</b>  |  |           |           |
|---|--|-----------|-----------|
| <b>2</b>  | <p><b>Detailed Estimates</b></p> <p>2.1 Definition and purpose of detailed estimates</p> <p>2.2 Types of detailed estimates – Fresh / New estimate, Revised estimate, Supplementary estimate, Maintenance estimate, Repair and Special repair estimates.</p> <p>2.3 Data required for preparing detailed estimates</p> <p>2.4 Factors to be considered during preparation of detailed estimate.</p> <p>2.5 Provisions in detailed estimate for contingencies, work charged establishment, Provisional items, Provisional sum, Provision for water supply and sanitary works, Electrical wiring and installations, Centage charges, Tools and Plants, Prime Cost and Daywork.</p>   | <b>06</b> | <b>08</b> |
| <b>COURSE OUTCOME CEG404-3. Calculate quantities of various items of buildings and prepare abstract.</b>  |  |           |           |
| <b>3</b>  | <p><b>Preparing Detailed Estimate of Building</b></p> <p>3.1 Unit quantity method and total quantity method</p> <p>3.2 Steps in preparing detailed estimate- Tacking out quantities, Abstracting. Measurement sheet, Abstract sheet and Face sheet</p> <p>3.3 Procedure for taking out quantities for building work items such as Earth work in foundation , Foundation concrete, Stone/ Brick masonry work in foundation, plinth and superstructure by Long wall and short wall method and Centre line method</p> <p>3.4 Procedure of detailed estimate for One room, Two room and complete 1B.H.K. load bearing structure</p> <p>3.5 Procedure for R.C.C work by using</p> <ul style="list-style-type: none"> <li>• Thumb rule for reinforcement quantity calculation for Slab , Beam, Column, Footing etc.</li> <li>• Preparing Bar bending Schedule for Lintel, Beam, Slab, Column and Footing</li> <li>• Detailed estimate of small R.C.C. structure such as Hall with column, footing, beams and slab including preparing schedule of reinforcement</li> </ul> | <b>14</b> | <b>20</b> |
|   | <b>Total</b>   | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |



**Section II**

| Sr. no.  | Topics   | Teaching (Hours) | Theory evaluation Marks |
|--|--|------------------|-------------------------|
| <b>COURSE OUTCOME CEG404-4. Draft detailed specifications for the items of civil engineering works.</b>  |  |                  |                         |
| 4  | <p><b>Specifications</b></p> <p>4.1 Definition of specification and its necessity Purpose and legal aspect of specifications.</p> <p>4.2 Types of specifications – General, Detailed, Manufacturers and Standard specifications.</p> <p>4.3 Points to be considered in framing the specification of an item.</p> <p>4.4 Drafting detailed specification for common items of civil engineering works such as P.C.C. ,R.C.C., Brick, Stone Masonry, Door, windows, specifications for plumbing, and Plastering</p> <p>4.5 Standard specification book</p>  | 08               | 10                      |
| <b>COURSE OUTCOME CEG404-5. Prepare Rate Analysis for the items of civil engineering works.</b>          |  |                  |                         |
| 5  | <p><b>Rate Analysis</b></p> <p>5.1 Definition, Necessity of Rate Analysis.</p> <p>5.2 Factors affecting Rate Analysis</p> <p>5.3 Data required for rate analysis</p> <p>5.4 Market rates for materials and labours</p> <p>5.5 Task work- definition and factors affecting the task work, Task works for various items of work</p> <p>5.6 Transportation of construction materials – Capacities of Truck, Dumpers and carts and their costs.</p> <p>5.7 Labour – Categories of labours</p> <p>5.8 Overheads- General and job overheads, Contractors profit and water charges.</p> <p>5.9 Calculation of quantities of materials required for various items of work such as B.B. Masonry, Half brick work, Stone masonry, Cement concrete, P.C.C. Flooring, Tiled flooring, Cement plaster</p> <p>5.10 Analysis of rates of civil engineering items such as P.C.C., R.C.C., Brick masonry in cement mortar in superstructure, U.C.R. masonry in cement mortar, P.C.C flooring and Ceramic flooring</p> | 16               | 18                      |
| <b>COURSE OUTCOME CEG404-6. Calculate quantities of earthwork and prepare detailed estimate of road.</b> |  |                  |                         |

|          |   |           |           |
|----------|---|-----------|-----------|
| <b>6</b> | <b>Calculation of Quantities of Earth work for different civil engineering works</b><br>6.1 Methods of Mean area, Mid sectional area, Trapezoidal and Prismoial formula (No derivations) for calculation of earth work.<br>6.2 Earth work calculation for Roads, Dam, Canals, Railway Embankment<br>6.3 Detailed estimate of a new road including computation of earth work | <b>08</b> | <b>12</b> |
|          | <b>Total</b>  | <b>32</b> | <b>40</b> |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

### **INSTRUCTIONAL STRATEGIES :**

#### **Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

#### **Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

#### **Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

#### **Specification table for setting question paper for semester end semester (theory) examination :**

| Topic No. | Name of topic   | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Mark |
|-----------|---|--|------------|-------------|----------------|------------|
|           |   | Remember                                     | Understand | Application |                |            |
| 1         | Introduction  | 04   | 04         | 04          | CEG404-1       | 12         |
|           | Approximate Estimates   |  |            |             |                |            |
| 2         | Detailed Estimates  | 02   | 02         | 04          | CEG404-2       | 08         |
| 3         | Preparing Detailed Estimates of Buildings                               | 04   | 04         | 12          | CEG404-3       | 20         |
| 4         | Specifications  | 02   | 02         | 06          | CEG404-4       | 10         |
| 5         | Rate Analysis   | 04   | 04         | 10          | CE5404-5       | 18         |
| 6         | Calculation of Quantities of work for different civil engineering works | 02   | 02         | 08          | CEG404-6       | 12         |
|           | <b>TOTAL</b>  | <b>16</b>                                    | <b>18</b>  | <b>46</b>   |                | <b>80</b>  |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**REFERENCE MATERIAL :**

**Books / P.W.D. Handbook/Journals / IS Codes / D.S.R. prepared by P.W.D.**

**Reference Books:**

| Sr. No. | Author                     | Title  | Publisher  |
|---------|----------------------------|--|--|
| 1.      | B.N. Datta                 | Estimating and costing                               | U B S Publishers Distributors Pvt. Ltd., New Delhi |
| 2.      | M. Chakraborti             | Estimating and costing, Specification and Valuation  | M. Chakraborti, Calcutta                           |
| 3.      | S.C. Rangwala              | Elements of Estimating and costing                   | Charator Publication, Anand                        |
| 4.      | B.S. Patil                 | Civil Engg. Contracts & estimates                    | Orient Longman, Mumbai                             |
| 5.      | G.S. Birdi                 | Test Book of Estimating & costing                    | Dhanpat Rai & Sons, Delhi                          |
| 6       | R.H. Nanavati              | Valuation  |  |
| 7       | S.C. Rangwala              | Valuation  | Charator Publication, Anand                        |
| 8       | Bureau of Indian Standards | Standard mode of Measurement for Building - I.S.1200 | Bureau of Indian Standards                         |
| 9       | Bureau of Indian Standards | S.P. 13 I.S. 7272 Part – I                           | Bureau of Indian Standards                         |

|    |                      |   |                      |
|----|----------------------|---|----------------------|
| 10 | Govt. of Maharashtra | P.W. and Housing Department, Govt.of Maharashtra, Vol.I (1979), Vol.II (1981) | Govt. of Maharashtra |
|----|----------------------|---|----------------------|

**e) I.S. Codes :**

1. IS 456:2000 - Plain and Reinforced concrete code of Practice
2. SP16- Design Aids for reinforced concrete to IS 456
3. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.
4. SP 24 - Explanatory Handbook on IS 456
5. IS 1343-1980 - Indian Standard code of (Reaffirmed 1990) Practice for Prestressedconcrete.
6. SP34 : 1987 - Handbook on concrete reinforcement and Detailing.
7. IS 13920-1993 Ductile Detailing of R. C. Building subjected to Seismic forces.

**f) Websites :**

1. [www.iitk.ac.in/nicee/IITK-GSDMA/EQ22.pdf](http://www.iitk.ac.in/nicee/IITK-GSDMA/EQ22.pdf)
2. [en.wikipedia.org/wiki/Intze\\_Principle](http://en.wikipedia.org/wiki/Intze_Principle)
3. [en.wikipedia.org/wiki/Reinforced\\_concrete](http://en.wikipedia.org/wiki/Reinforced_concrete)

**COURSE ID :**

**Course Name : CONCRETE TECHNOLOGY**  
**Course Code : CEG405**  
**Course Abbreviation : GCTE**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme :**

| Scheme Component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination            |                      | Total |
|-----------------------|---------------------------------------|---|---------------------------------|----------------------|-------|
|                       | Theory                                | Practical   | Theory                          | Practical (Internal) |       |
| Details of Evaluation | Average of two tests of 20 marks each | 1. 25 marks for Continuous Assessment<br>2. 25 marks Progressive skill test<br>3. 25 marks for microproject | Term End Theory Exam (03 hours) | As per Proforma IV   |       |
| Marks                 | 20                                    | --  | 80                              | 75 I                 | 175   |

**RATIONALE :**

Concrete is one of the most versatile materials used in civil engineering construction. Properties of concrete depend on the properties of its ingredients and construction practices. This course covers study of basic properties and testing methods of fresh and hardened concrete as well as its ingredients. The study of formwork, admixtures, special concretes has also been included. Concrete mix design has also been introduced.

**COMPETENCY :**

Apply study and apply principles of concrete technology as follows :

**Cognitive :** Understanding and applying principles of concrete technology to engineering structures

**Psychomotor :** i) Calculating skills ii) drafting skills

**Affective :** Attitude of i) precision ii) accuracy iii) safety iv) punctuality

**COURSE OUTCOMES :**

- CEG405-1** Explain procedure of production of concrete  
**CEG405-2** Explain, test and interpret properties of cement and aggregate  
**CEG405-3** Explain, test and interpret properties of fresh concrete  
**CEG405-4** Explain concrete mix design and form work  
**CEG405-5** Explain, test and interpret properties of hardened concrete and quality control  
**CEG405-6** Explain and select special concretes for the purpose

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs  | Programme Outcomes POs and PSOs               |                             |   |  |  |                               |                                   |                               |   |  |
|---|---|-----------------------------|---|--|--|-------------------------------|-----------------------------------|-------------------------------|---|--|
|   | PO 1<br>Basic and<br>disciplined<br>knowledge | PO 2<br>Problem<br>analysis | PO 3<br>Design/<br>development<br>of<br>solutions | PO 4<br>Engineering<br>Tools/<br>experimentation<br>and<br>testing | PO 5<br>The engineering<br>practice for<br>society,<br>Sustainability<br>and environment | PO 6<br>Project<br>management | PO 7<br>Life-<br>long<br>learning | PSO1<br>Plan<br>and<br>Design | PSO<br>2<br>Const<br>ructio<br>n and<br>Maint<br>enanc<br>e | PSO3<br>Problem<br>Solving<br>on field |
| <b>Competency:</b> Apply study and apply principles of concrete technology as follows           | 2   | 1                           | 2   | 2  | 2  | 1                             | 2                                 | 1                             | 1   | 1                                      |
| <b>CEG405-1</b> Explain procedure of production of concrete                                     | 3   | 1                           | 1   | 2  | 1  | -                             | 1                                 | 1                             | 2   | 1                                      |
| <b>CEG405-2</b> Explain, test and interpret properties of cement and aggregates                 | 3   | 1                           | 1   | 2  | 2  | -                             | 2                                 | 1                             | 1   | 1                                      |
| <b>CEG405-3</b> Explain, test and interpret properties of fresh concrete                        | 2   | 1                           | 1   | 2  | 2  | -                             | 1                                 | 1                             | 1   | 1                                      |
| <b>CEG405-4</b> Explain concrete mix design and formwork  | 2   | 2                           | 2   | 2  | 2  | 2                             | 2                                 | 1                             | 2   | 2                                      |
| <b>CEG405-5</b> Explain, test and interpret properties of hardened concrete and quality control | 2   | 1                           | 2   | 2  | 1  | 1                             | 2                                 | 1                             | 1   | 2                                      |
| <b>CEG405-6</b> Explain and select special concretes for the purpose                            | 2   | 1                           | 1   | 1  | 1  | 1                             | 1                                 | 1                             | 1   | 2                                      |

**CONTENT :**

**A) PRACTICAL**

B) (*Laboratory Manual on Concrete Technology* developed by the Institute shall be used)

| Sr. No | Laboratory Experience   | Skills / Competencies to be developed  |          |
|--------|---|--|----------|
| A      | Any ten experiments   |  |          |
| 1      | Determination of fineness of cement   | Follow IS code procedures for tests.<br><br>Studying equipment.<br><br>Understanding test procedure<br><br>Accuracy in taking observation.<br><br>Reinforcement of concepts.<br><br>Performing calculation and plotting<br><br>Graphs from observation.<br>Interpreting test results.<br><br>Classifying materials as per IS standards.<br><br>Finding quality of material.<br><br>Design Procedure. | CEG405-2 |
| 2      | Determination of consistency of cement  |  | CEG405-2 |
| 3      | Determination of initial and final setting time of cement   |  | CEG405-2 |
| 4      | Determination of the Soundness of cement  |  | CEG405-2 |
| 5      | Determination of 3,7- and 28-days strength of cement  |  | CEG405-2 |
| 6      | Determination of silt content of fine aggregate   |  | CEG405-2 |
| 7      | Determination of bulking of fine aggregate  |  | CEG405-2 |
| 8      | Determination of specific gravity of coarse aggregate and fine aggregate  |  | CEG405-2 |
| 9      | Determination of grading of aggregate by sieving  |  | CEG405-2 |
| 10     | Determination of bulk density of fine aggregate and coarse aggregate  |  | CEG405-2 |
| 11     | Determination of aggregate crushing value   |  | CEG405-2 |
| 12     | Determination of aggregate impact value   |  | CEG405-2 |
| 13     | Determination of workability of concrete by slump cone and/or compaction factor method  |  | CEG405-3 |
| 14     | Determination of compressive strength of concrete cubes (if available ready cubes)  |  | CEG405-5 |
| B      | Determination of compressive strength of concrete with any one of the NDT equipment   |  | CEG405-5 |
| C      | Write IS code procedure for mix design (With help of a video) of any one of the Grade of concrete for data given by the teacher |  | CEG405-4 |
| D      | Field visit to construction site of RCC to study various concreting activities<br>Field visit to a ready-mix concreting plant   |  |          |

**B) Micro Projects: (One project to the group of 4/5 students)**

1. Market survey for study of cement/aggregates /admixtures /additives available in market and prepare a report
2. Field visit to quarry and crusher for manufacture of coarse aggregate (stone metal)and prepare a report.
3. Field visit to observe formwork, scaffoldings and prepare a report.
4. Visit to site for quality control of material used for construction and prepare a report.
5. Collection of information for concreting methods, new trends in the field and prepare a report.
6. Demonstration through video film for different methods of concrete.
7. Collection of photographs from site for different operations and prepare chart/report.
8. Collection of data/stipulations from site for the mix design.
9. Collection of material testing reports from construction site.
10. Prepare a chart of IS code for testing of materials.
11. Prepare a chart of IS code specifications for apparatus /machines used for concrete practicals.
12. software-based exercises.

**C) INDUSTRIAL EXPOSURE**

| SN | Mode of Exposure                     | Topic                                |
|----|--------------------------------------|--------------------------------------|
| 1. | Field examples of course application | Topics of theory syllabus            |
| 2. | Market survey                        | Admixtures available in market       |
| 3. | Field visits                         | Concreting procedure, RMC plant etc. |

**EVALUATION OF PRACTICAL WORK:**

**Continuous Assessment of each experiment/visit/microprojects:**

| S. No | Criteria                               | Marks allotted |
|-------|--|----------------|
| 1     | Punctuality                            | 5              |
| 2     | Preparedness and self-learning ability | 5              |
| 3     | Correctness of figures / diagrams      | 5              |
| 4     | Observation skill                      | 5              |
| 5     | Result table / calculations / graphs   | 5              |
|       | <b>Total</b>                           | <b>25</b>      |

**Assessment Criteria for Term End Practical Examination:**

At least one practical, based on term work produced by the candidate, shall be asked by the examiner during the practical examination



**D) THEORY:**

**Section I**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|----------|--|------------------|---------------------------|
| <b>1</b> | <b>CEG405-1 Explain procedure of production of concrete</b>  | <b>08</b>        | <b>16</b>                 |
|          | <p><b>1.1 Introduction to concrete</b></p> <p>Definition of Concrete. Ingredients of Concrete, Importance of concrete as construction material. Historical background.</p> <p>Process diagram of concrete. Role of each ingredient.</p> <p>Admixtures: Definition and function. Accelerator, Retarder, Plasticizer, Super plasticizer. Pozzolanic fly ash, silica fume, slag, metakaolin.</p> <p><b>1.2 Production of Concrete</b></p> <p>Process diagram of manufacture of concrete,</p> <p>Batching of ingredients of concrete.</p> <p>Mixing of concrete and concrete mixers,</p> <p>Transportation of concrete: Modes &amp; precautions ,</p> <p>Placing of concrete &amp; Precautions,</p> <p>Compaction of concrete: Definition, importance &amp; methods,</p> <p>Finishing of concrete surface,</p> <p>Curing of concrete: Definition, importance and methods</p> |                  | <b>08</b>                 |
| <b>2</b> | <b>CEG405-2 Explain, test and interpret properties of cement and aggregates</b>  | <b>12</b>        | <b>16</b>                 |
|          | <p><b>2.1 Properties and testing of cement</b></p> <p>Definition of cement. Chemical composition of Portland cement, Raw material and manufacturing process of Portland cement, Hydration of cement. Setting and Hardening of cement. Physical properties of cement &amp; standard specifications for Ordinary Portland Cement. Grades of OPC.</p> <p>Types of cement and their applications: Rapid hardening cement, low heat cement, Portland pozzolana cement, sulphate resisting cement, blast furnace slag cement, white cement. , Storage of cement</p>  |                  | <b>08</b>                 |

|   |   |           |           |
|---|---|-----------|-----------|
|   | <p><b>2.2 Properties and testing of aggregates</b></p> <p>Definition of coarse and fine aggregate. Classification of aggregate, Properties of coarse and fine aggregates: Size, Shape, Texture, Strength, Specific gravity, Bulk Density, Water absorption, Bulking of sand, Soundness.</p> <p>Determination of aggregate grading, Sieve analysis, Fineness modulus, Crushing value, Impact Value, Abrasion Value, Flakiness index, Elongation Index</p> <p>Effect of aggregate properties on strength of concrete.</p> |           |           |
| <b>3</b>  | <b>CEG405-3 Explain, test and interpret properties of fresh concrete</b>  | <b>04</b> | <b>08</b> |
|   | <p>Definition of workability and affecting factors.<br/>Measurement of workability. Slump cone test, Compaction factor Test.</p> <p>Range of values of workability</p> <p>Segregation : Definition, effects and precautions</p> <p>Bleeding : Definition, effects and precautions</p>   |           |           |
|   | <b>TOTAL</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

### Section-II

| Sr. no.  | Topics   | Teaching (Hours) | Theory Evaluation                    |
|----------|--|------------------|--------------------------------------|
| <b>4</b> | <b>CEG405-4 Explain concrete mix design and formwork</b>   | <b>06</b>        | <b>12</b>                            |
|          | <p><b>4.1 Introduction to Mix design</b></p> <p>Definition and importance of mix design, Methods used for mix design (only list), Procedure of mix design by IS code method (no problems)</p> <p><b>4.2 Formwork</b></p> <p>Definition and purpose of formwork. Requirement of good formwork<br/>Materials used for formwork,<br/>Forms for beam, slab, column. Stripping of forms</p> |                  | 06<br><br><br><br><br><br><br><br>06 |



**Specification table for setting question paper for semester end theory examination**

| Topic No. | Name of topic                                       | Distribution of marks (level wise) |            |           | Total Marks |
|-----------|---|------------------------------------|------------|-----------|-------------|
|           |   | Remember                           | Understand | Apply     |             |
| 1.        | Introduction to Concrete and Production of Concrete | 02                                 | 04         | 10        | 16          |
| 2.        | Properties and testing of cement and aggregates     | 02                                 | 04         | 10        | 16          |
| 3.        | Properties of fresh concrete                        | 02                                 | 02         | 04        | 08          |
| 4.        | Introduction to Concrete Mix Design and formwork    | 02                                 | 04         | 06        | 12          |
| 5.        | Properties of Hardened Concrete and Quality Control | 02                                 | 04         | 10        | 16          |
| 6.        | Special Concretes                                   | 02                                 | 04         | 06        | 12          |
|           | <b>Total</b>  | <b>12</b>                          | <b>22</b>  | <b>46</b> | <b>80</b>   |

**IMPLEMENTATION STRATEGY:**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .
5. Field Visits

**Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

**Teaching and Learning Resources:**

1. Chalk & board
2. Audio-visual material
3. Laboratory manual

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Question Bank

**Reference Books :**

| <b>SNo.</b> | <b>AUTHOR</b> | <b>TITLE</b>           | <b>PUBLISHER</b>            |
|-------------|---------------|------------------------|-----------------------------|
| 1.          | M.S.Shetty    | Concrete Technology    | S.Chand& Co ltd., New Delhi |
| 2.          | M. L. Gambhir | Concrete Technology    | Tata Mc Graw Hill           |
| 3           | Neville       | Properties of Concrete | Pearson Education India     |
| 4           | Santhakumar   | Concrete Technology    | Oxford Press                |

**Websites :**

- i) <http://www.youtube.com/watch?v=n-Pr1KTVSXo>
- ii) <http://www.youtube.com/watch?v=oM7SVIeoODs>

\* \* \*

**COURSE ID:**

**Course Name : BUILDING SERVICES**  
**Course Code : CEG406**  
**Course Abbreviation : GBSR**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : NIL**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                       |  | Term End Examination |                    | Total |
|-----------------------|--|--|----------------------|--------------------|-------|
|                       | Theory   | Practical                              | Theory               | Oral               |       |
| Details of Evaluation | Average of Two tests of 20 marks each (1 hour duration each) | One Progressive Skill Test of 25 marks | One paper (3 hours)  | As per proforma IV |       |
| Marks                 | 20   | 25                                     | 80                   | 25 I*              | 125   |

\*(To be assessed by internal examiner) \*\* (To be assessed by internal and external examiner)

**RATIONALE:**

Building cannot be used for occupancy unless various services required for effective working of building is provided. It creates healthy and working environment in the building. Building services provide comfort, efficient and safe use. The knowledge of building services is necessary to maintain the functional requirement of the building by a Civil Engineer. By considering design aspects and recent materials, student will develop the skill and ability to become an entrepreneur for these services.

**COMPETENCY**

Apply principles of Building Services to solve engineering problems as follows.

**Cognitive: Understanding** and applying principles of Building Services to engineering problems.

**Psychomotor :** i) Designing Building services components ii) Fixing the parameters of building services  
 iii) Designing most economical material for building services

**Affective: Attitude** of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation  
 iv) hygiene vi) civic sense

**COURSE OUTCOMES:**

- CEG406-1** Identify Component of building services
- CEG406-2** Planning plumbing fixtures for different types of buildings
- CEG406-3** Technique of various treatments to the building
- CEG406-4** Deciding the modes of vertical communication
- CEG406-5** Providing lighting and ventilation system to the buildings
- CEG406-6** Planning of rain water harvesting & fire safety.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”:no correlation]

| Competency and COs  | Programme Outcomes POs and PSOs               |                       |                                       |   |  |                         |                         |                      |                                   |                               |
|---|---|-----------------------|---------------------------------------|---|--|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
|   | PO 1 Basic knowledge and Discipline Knowledge | PO 2 Problem Analysis | PO 3 Design /Development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering Practices for society, sustainability and environment | PO 6 Project Management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
| <b>Competency:</b> Apply principles of Building services to solve engineering problems. | 3   | 1                     | 3                                     | 3   | 1  | 1                       | 3                       | 3                    | 3                                 | 1                             |
| <b>CEG406-1</b> Identify Component of building services                                 | 3   | 3                     | 3                                     | 1   | 1  | 1                       | 1                       | 3                    | 3                                 | 1                             |
| <b>CEG406-2</b> Planning plumbing fixtures for different types of buildings             | 3   | 3                     | 3                                     | 1   | 1  | 1                       | 1                       | 3                    | 3                                 | 1                             |
| <b>CEG406-3</b> Technique of various treatments to the building.                        | 3   | 3                     | 3                                     | 3   | 1  | 1                       | 2                       | 3                    | 3                                 | 1                             |
| <b>CEG406-4</b> Deciding the modes of vertical communication                            | 3   | 3                     | 3                                     | 2   | 1  | 1                       | 2                       | 3                    | 3                                 | 1                             |
| <b>CEG406-5</b> Providing lighting and ventilation system to the buildings              | 3   | 3                     | 3                                     | 2   | 1  | 1                       | 2                       | 3                    | 3                                 | 1                             |
| <b>CEG406-6</b> Planning rain water harvesting & fire safety.                           | 3   | 3                     | 3                                     | 2   | 1  | 1                       | 2                       | 3                    | 3                                 | 1                             |

## PRACTICALS/EXERCISES

### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:  
Practical work is divided in three parts as below –

- A) Seminar and report.
- B) Site visits.
- C) Micro project

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed   | Course Outcome  |
|--------|---|---|---|
| A      | <p><b>Seminar&amp; Report</b><br/>Students can select any topic from contents by text book, professional magazines, technical papers published and websites. Make a seminar presentation of 10 minutes using power point and make a report. Weightage is assigned for contents and presentation skills. (Students can work in a group of two.)</p>  | <ol style="list-style-type: none"> <li>1. Developing Self learning ability.</li> <li>2. Developing Presentation skills.</li> </ol>  | <p>CEG406-2<br/>CEG406-3<br/>CEG406-4<br/>CEG406-5<br/>CEG406-6</p> |
| B      | <p><b>Visits and detailed Report</b><br/>Visit to Plumbing work site of water supply or drainage system.<br/>Visit to any treatment site<br/>Visit to Lift or escalators<br/>Visit to electric fitting installation site or AC installation<br/>Visit to RWH or fire safety provided site.</p>  | <p>Observe the plumbing system<br/>Observe the treatment process and material used<br/>Observe the component of vertical communication<br/>Observe the component</p>  | <p>CEG406-2<br/>CEG406-3<br/>CEG406-4<br/>CEG406-5<br/>CEG406-6</p> |
| 3      | <p><b>Suggested Micro-Projects</b><br/><br/><b>Any one project for group of three to five students.</b></p> <ol style="list-style-type: none"> <li>1. Prepare a layout plan of Plumbing system to a small building and prepare a report</li> <li>2. Collect the information about various treatment materials available in local market and prepare a report.</li> <li>3. Prepare a report on water proofing/damp proofing /termite proofing including a case study</li> <li>4. Collect the information of lift/ escalators installed nearby vicinity.</li> <li>5. Collect information about electrical materials from local markets and prepare report</li> <li>6. Prepare layout plan of RWH/Fire safety system to a small building and prepare a report</li> </ol> | <ol style="list-style-type: none"> <li>1.Information collection and presentation in the form of report.</li> <li>2.Motivation through field exposure.</li> <li>3.Developing self learning ability.</li> </ol> |   |



**CONTENT: THEORY**

**Section – I**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>Course Outcome- CEG406-1</b> Identify Component of building services                     |   |                  |                           |
| <b>1</b>  | <p><b>Component of building services</b></p> <p>1.1 classification of buildings as per national building code, necessity of building services, Functional requirement of building, Different types of building services i.e. plumbing services, lift, escalators, air conditioning, rain water harvesting etc.</p> <p>1.2 Role and responsibility of building service engineer. Concept of smart building.</p>  | <b>03</b>        | <b>04</b>                 |
| <b>Course Outcome- CEG406-2</b> Planning plumbing fixtures for different types of buildings |   |                  |                           |
|   | <p><b>Plumbing</b></p> <p>2.1 Elements of plumbing – Objective of Plumbing, Purpose of Plumbing, Role of Plumber and their function, Sewer, air supply, drainage and vent pipes, Application for obtaining water supply connection.</p> <p>2.2 Pipes, Joints and Fittings – Introduction, types of pipes such as GI Pipes, PVC Pipes, Copper Pipes, CI Pipes, AC Pipes, Pre-stressed Concrete Pipes, Method of Fixing Pipes such as GI Fittings, CI Fitting etc.</p> <p>2.3 Valves and terminal fitting – type of valves and its purpose, sluice valve, reflux valve, scour valve, air relief valve, pressure relief valve, gate valve, Bio-taps and stop valve, self closing valve, flush valve, mixing valve.</p> <p>2.4 Sanitary fixtures and building drainage system – Building sanitary fittings such as water closet, flushing appliances, urinals, wash basins, flushing cisterns, principles of building drainage, symphonic action, traps and its types, capacity and sizing of pipes, soil pipe, waste pipe, rain water pipe, system of plumbing, installation of pipes, testing of pipes.</p> | <b>11</b>        | <b>18</b>                 |

| <b>Course Outcome- CEG406-3</b> Technique of various treatments to the building  |   |           |           |
|--|---|-----------|-----------|
| <b>3</b>   | <p><b>Treatments to the buildings</b></p> <p><b>a) Water proofing treatment</b><br/>3.1 Introduction, Material required for water proofing and its specification<br/>3.2 Process of Water proofing of water closet, bathroom, Terrace and basement.<br/>3.3 Precautions to be taken while water proofing.</p> <p><b>b) Damp proofing treatment</b><br/>3.4 Sources of dampness and its effect<br/>3.5 Material and methods of damp proofing<br/>3.6 Damp proofing treatment in building such as basement, floorsand walls.</p> <p><b>c) Anti termite treatment</b><br/>3.7 Causes of termite attacks<br/>3.8 Materials and Types of Anti termite treatments<br/>3.9 Process of Anti termite treatment</p> | <b>10</b> | <b>18</b> |
|  | <i>Total</i>  | <b>24</b> | <b>40</b> |
| <p>(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.)</p> |   |           |           |

### Section II

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>Course Outcome - CEG406-4</b> Deciding the modes of vertical communication |   |                  |                           |
| <b>4</b>  | <p><b>Modes of vertical communication</b></p> <p>4.1 Objective and modes of vertical communications in the buildings<br/>4.2 Definition of lifts and basic parts of lifts<br/>4.3 Types of lifts and uses<br/>4.4 Design consideration for basic size calculation of space enclosure to accommodate lift services.<br/>4.5 Different types of Escalators and its uses.<br/>4.6 Design provisions for basic size calculation of space enclosure to accommodate escalator services.<br/>4.7 Necessity of ramp, gradient of ramp<br/>4.8 Special provisions required to the ramp for physically handicapped persons.</p> | <b>04</b>        | <b>08</b>                 |

|   |   |           |           |
|---|---|-----------|-----------|
|   |   |           |           |
| <b>Course Outcome - CEG406-5</b> Providing lighting and ventilation system to the buildings   |   |           |           |
| <b>5</b>  | <b>Lighting and Ventilation to the Building</b><br><br>5.1Types of lighting (Natural and artificial), factors influencing the brightness of room.<br>5.2Preparing layout and conventions used to indicate lights, fans, telephones and other communication systems<br>5.3Type of lamps:Incandescent, tungsten, halogen, Fluorescent lamps, Fluorescent mercury lamps etc.<br>5.4Open and Concealed wiring systems, Concept of earthing, Emergency power supply (Generators)<br>5.5Precautions to avoid electrical accidents, safety measures.<br>5.6 Concept of ventilation, necessity<br>5.7 Types of ventilation<br>5.8 Basic principal of air conditioning | <b>10</b> | <b>16</b> |
| <b>Course Outcome - CEG406-6</b> Planning of rain water harvesting & fire safety.   |   |           |           |
| <b>6</b>  | <b>Rain Water Harvesting &amp; Fire Safety.</b><br><br>6.1 Concept of Rain Water Harvesting (RWH), necessity<br>6.2 Component of RWH<br>6.3 Types of filters used in RWH<br>6.4 Types of RWH ( Storage and Ground water recharge)<br>6.5 Fire protection requirements for multi-storyed building.<br>6.6 Fire detecting & various extinguishing systems<br>6.7 National Building Code provision<br>For fire safety.   | <b>10</b> | <b>16</b> |
|   | <b>Total</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

**Specification table for setting question paper for semester end theory examination :**

| Topic No.    | Name of topic                            | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|--------------|--|--|------------|-------------|----------------|-------------|
|              |  | Remember                                     | Understand | Application |                |             |
| 1            | Component of building services           | 02   | 02         | -           | CEG406-1       | 04          |
| 2            | Plumbing                                 | 08   | 06         | 04          | CEG406-2       | 18          |
| 3            | Treatments to the buildings              | 06   | 08         | 04          | CEG406-3       | 18          |
| 4            | Modes of vertical communication          | 02   | 02         | 04          | CEG406-4       | 08          |
| 5            | Lighting and Ventilation to the Building | 04   | 08         | 04          | CEG406-5       | 16          |
| 6            | Rain Water Harvesting & Fire Safety.     | 04   | 08         | 04          | CEG406-6       | 16          |
| <b>TOTAL</b> |  | <b>26</b>                                    | <b>34</b>  | <b>20</b>   |                | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                              | Topic                            |
|----|---|----------------------------------|
| 1. | Field Visits                                  | Every chapter of theory syllabus |
| 2. | Collecting data for seminar and micro project | Practical/Exercise               |

**ASSESSMENT CRITERIA FOR PRACTICAL WORK**

**i) Continuous Assessment of Practical/Exercise Work:**

Every practical assignment shall be assessed for 25 marks as per following criteria:

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**iii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted and Final marks shall be awarded as per *Assessment Pro-forma IV*.

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

**Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by concerned faculty.

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL:**

**Books / Journals / IS Codes / Websites**

| Reference Books: Sr No | AUTHOR           | TITLE   | PUBLISHER   |
|------------------------|------------------|---|---|
| 1.                     | S. Deolalikar    | Plumbing design and practice  | TATA McGraw Hill publishing co., New Delhi                |
| 2.                     | S. M. Patil      | Building services   | Patil publications, Goregaon, Mumbai                      |
| 3.                     | SandeepMantri    | A to Z of practical building and its management                               | Mantri institute of development, Pune                     |
| 4.                     | Bindra and Arora | Building construction   | DhanpatRai publishing co.,                                |
| 5.                     | S. L. Uppal      | Electrical wiring - estimating and costing.                                   | Khanna publication, New Delhi                             |
| 6.                     | S. Arthanari     | Building Technology and valuation   | TATA McGraw Hill publishing co., New Delhi                |
| 7                      | S. P. Bag        | Fire services in India: History, Detection, Protection, Management            | Mittal Publication, New Delhi, 1995, ISBN 8170995981      |
| 8                      | Akhil Kumar Das  | Principles of Fire safety Engineering: Understanding Fire and Fire Protection | PHI learning Pvt. LTD, New Delhi. 2014, ISB:9788120350380 |
| 9                      | BIS              | National Building Code Part 1,4,8,9   | Bureau of Indian Standard, New Delhi                      |

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**COURSE ID:**

**Course Name** : PLUMBING SERVICES  
**Course Code** : CEG407  
**Course Abbreviation** : GPSR

**TEACHING AND EVALUATION SCHEME**

**Pre-requisite Course(s)** : *nil*

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                       |  | Term End Examination |                    | Total |
|-----------------------|--|--|----------------------|--------------------|-------|
|                       | Theory   | Practical                              | Theory               | Oral               |       |
| Details of Evaluation | Average of Two tests of 20 marks each (1 hour duration each) | One Progressive Skill Test of 25 marks | One paper (3 hours)  | As per proforma IV |       |
| Marks                 | 20   | 25                                     | 80                   | 25 I*              | 125   |

\*(To be assessed by internal examiner) \*\* (To be assessed by internal and external examiner)

**RATIONALE:**

A properly systematic course in Plumbing is rarely available in India. Plumbing though crucial but remained as neglected subject. As a result, there is a great demand to well trained Plumbing Professionals in the building industry.

Plumbing service is necessary for proper water supply & efficient drainage facility in a building. As building planning is becoming more complex with modern plumbing materials and systems are available in India, it is necessary to include the same in the Civil Engineering curriculum. Plumbing services are important component of Civil Engineering. Internal plumbing contributes to around 15% of the construction cost. Indian Plumbing Association (IPA) has adopted, reviewed and revised the Uniform Plumbing Code of International association of Plumbing and Mechanical officials to suit Indian practices, customs and Laws. The code is published as Uniform Plumbing Code – 2008 India (UPC1).

Need of proper use of Plumbing code must be code based education and training in Plumbing will have better job opportunities and improved income. The formal education in Plumbing will improve the plumbing system design and installation standards, thereby ensuring health and safety of people, structure and environment.

## COMPETENCY

Apply principles of sanitation and knowledge of plumbing to solve engineering problems.

**Cognitive:** Understanding and applying principles of sanitation and knowledge of plumbing to solve engineering problems.

**Psychomotor:** i) Handling all types of sanitary fittings ii) Interpretation of drawings iii) preparing layout-plan of water supply and drainage arrangement.

v) **Affective:** Attitude of i) precision ii) Hygiene iii) safety iv) Sanitation v) aesthetic presentation Civic sense

## COURSE OUTCOMES:

**CEG407-1** Know the terminology in plumbing.

**CEG407-2** Know the different types of plumbing fixtures and fittings.

**CEG407-3** Know various types of traps, plumbing systems and venting system.

**CEG407-4** Know the principles of sanitation and objects of sewage disposal, construction of sanitary drainage and storm water systems and Select the proper plumbing materials.

**CEG407-5** Understand system of water supply, gray water, reclaimed water.

## COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and COs   | Programme Outcomes POs and PSOs                 |                          |  |  |   |                            |                            |                         |                                      |                                  |
|--|---|--------------------------|--|--|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|  | PO 1<br>Basic knowledge and Discipline<br>Known | PO 2<br>Problem Analysis | PO 3<br>Design /Development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering Practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of sanitation and knowledge of plumbing to solve engineering problems. | 3   | 3                        | 3  | 2  | 2   | 3                          | -                          | 3                       | 3                                    | 1                                |
| <b>CEG407-1</b> Know the terminology in plumbing.  | 3   | 3                        | -  | -  | 3   | 3                          | 1                          | 2                       | 2                                    | 1                                |
| <b>CEG407-2</b> Know the different types of plumbing fixtures and fittings                                 | 3   | 3                        | 3  | 2  | 3   | 2                          | 3                          | 2                       | 2                                    | 1                                |



| Competency and COs  | Programme Outcomes POs and PSOs                  |                          |  |  |   |                            |                            |                         |                                      |                                  |
|---|--|--------------------------|--|--|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|   | PO 1<br>Basic knowledge and Discipline Knowledge | PO 2<br>Problem Analysis | PO 3<br>Design /Development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering Practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>CEG407-3</b> Know various types of traps and plumbing systems.   | 3  | 3                        | 3  | 3  | 3   | 3                          | 3                          | 2                       | 2                                    | 1                                |
| <b>CEG407-4</b> Know the principles of sanitation and objects of sewage disposal. Construction of sanitary drainage and storm water systems and Select the proper plumbing materials. | 3  | 3                        | 3  | 3  | 2   | 3                          | 2                          | 2                       | 2                                    | 1                                |
| <b>CEG407-5</b> Understand system of water supply, gray water, reclaimed water and methods to conserve water and energy.  | 3  | 3                        | 1  | 1  | 3   | 3                          | 2                          | 2                       | 2                                    | 1                                |

## PRACTICALS/EXERCISES

### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:  
Practical work is divided in four parts as below –

- A) Seminar and report.
- B) Site visits.
- C) Micro project

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed                                    | Course Outcome       |
|--------|---|--|----------------------|
| A      | <b>Seminar:</b><br>Students can select any topic from contents by referring codes, text book, professional magazines, technical papers published and websites of manufacturers and make a seminar presentation in 10 minutes using power point and make a report. Weightage is assigned for contents and presentation skills.(Students can work in a group of two.) | 1.Developing Self learning ability.<br>2.Developing Presentation skills. | CEG407-6<br>CEG407-7 |

|   |   |   |                                   |
|---|---|---|-----------------------------------|
| B | <p><b>Site visit:</b><br/>Visit any plumbing site and submit a report on observation on plumbing system, architectural and structural provisions, pipe materials, work method, safety and recommendations based on the provisions of UPC-I.</p>   | <p>8. Information collection and presentation in the form of report.<br/>9. Motivation through field exposure.<br/>4. Developing Self learning ability.</p>           | <p>CEG407-6<br/><br/>CEG407-7</p> |
| C | <p><b>Suggested Micro-projects:</b><br/><br/><b>Any one project for group of three to five students.</b></p> <p>1) Draw sketches of installation details of plumbing fixtures and fittings in plan, Elevation and section; with standard dimensions (minimum 4)</p> <p>2) Collect plumbing drawings for multi storied building, Interpretation of plumbing system.</p> <p>3) Draw toilet layouts, plans, elevations and sections of selected case. Give dimensions.</p> <p>4) Prepare layout of internal and external (outside the toilet) DWV pipes and fittings of a selected case. Write pipe diameters.</p> | <p>1. Information collection and presentation in the form of report.<br/><br/>2. Motivation through field exposure.<br/><br/>3. Developing self learning ability.</p> |                                   |

**CONTENT: THEORY**

**Section – I**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <i>Course Outcome-</i> CEG407-1 Know the terminology in plumbing. |   |                  |                           |
| 1   | <p><b>Plumbing Terminology.</b><br/>Definition, use/Location, purpose and sketches of the following</p> <p><b>1.1:</b>Plumbing fixture:- accessible /readily accessible,aerated fitting, bathroom group, carrier, flood level rim, floor sink, flush tanks, lavatories, toilet system, plumbing appliances,flushometer valve.</p> <p><b>1.2:</b> Traps, indirect waste,vent blow off,development length, parts of vent system – stack vent, branch vent, continuous vent,</p> | 06               | 12                        |

|   |   |           |           |
|---|---|-----------|-----------|
|   | <p>individual vent, dirty arm,FOG (Fat,Oil and Grease) disposal system receptors and slip joint.</p> <p><b>1.3:Drainage-</b> adapter fitting, AAV(Air Admittance Valve), air break,air gap,bell and spigot joint, branch, DFU(Drainage Fixture Unit Values), grease interceptor, roof drain , smoke test .</p> <p><b>1.4:Water supply :</b> angle valve, anti- scald valve, check valve, gate valve, PRE (Pressure Relief Valve), back flow, bypass, cross connection, ferrule.</p>   |           |           |
| <b>Course Outcome- CEG407-2</b> Know the different types of plumbing fixtures and fittings.   |   |           |           |
| <b>2.</b>   | <p><b>Plumbing fixtures and fixture fittings.</b><br/>Different types of plumbing fixtures, shapes/sizes, capacities, situation and used:</p> <p><b>2.1 Ablution fixtures</b> –Wash basin, sinks (kitchen sinks cleaner sinks), bath tub, flushing cistern.</p> <p><b>2.2 Soil fixtures</b> - water closets, urinal, mop sink, bidets, slop sinks plumbing fittings for Ablution fixtures and Soil fixtures.</p> <p><b>2.3 water conserving fixtures-</b> Water cooler, cloth washer, hot and cold water system, display fountain. Installation standard for plumbing fixtures, dimension in plan and elevation</p> | <b>08</b> | <b>14</b> |
| <b>Course Outcome- CEG407-3</b> Know various types of traps, plumbing systems and venting system.   |   |           |           |
| <b>3</b>  | <p><b>Traps, interceptors, indirect waste and vents.</b></p> <p><b>3.1 Traps-</b> Definition, function, Requirement of good trap, trap arms, Development length, trap seals, venting to traps, trap primers, Classification of traps.</p> <p><b>3.2 System of plumbing for building drainage-Two pipe system, one pipe system, waste receptors, dish washers, drinking fountain.</b></p> <p><b>3.3 Vent-</b> purpose of venting, trap seal protection, materials, vent connection, flood rim level, vent stacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, vent sizing.</p>             | <b>10</b> | <b>14</b> |
| <b>Total</b>  |   | <b>24</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |   |           |           |

**Section II**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>Course Outcome - CEG407-4</b> Know the principles of sanitation and objects of sewage disposal. Construction of sanitary drainage and storm water systems and Select the proper plumbing materials.                        |   |                  |                           |
| 4   | <p><b>Sanitary drainage and storm drain.</b></p> <p>4.1 Preamble on single and two pipe systems, different pipe materials and jointing methods, special joints, hangers, and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below inverted level, suds relief, building sewers, trenching, testing sumps and pumps, sizing of horizontal and vertical pipes.</p> <p>4.2 Storms drain required, prohibited connections, subsoil drains, sub drain, gutters/channels/scuppers, roof drains, strainers, leaders, conductors and connections, collect/capture storm water, discharging storm water, safety, traps required, prohibited installations.</p>  | 12               | 20                        |
| <b>Course Outcome – CEG407-5</b> Understand system of water supply, gray water, reclaimed water.  |   |                  |                           |
| 5   | <p><b>Water Supply, Gray and Reclaimed Water.</b></p> <p>5.1 Preamble on municipal water, sources of water, potable and non potable water, reclaimed water, water storage, hot and cold water distribution system, back flow protection, air gap, cross connection control, pipe materials and jointing method, alternative materials, hangers, and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure control, unions, thermal expansion, types of valves, installation and testing, disinfection, protection of underground pipes, color codes and arrow marking, introduction to WSFU (Water Supply Fixture Units).</p> <p><b>5.2:</b> Definition of gray water, approvals, specification, and drawing, safety, total gray water discharge, holding tanks, valves and piping, reclaimed water system, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses.</p> | 12               | 20                        |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                                  | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|--|--|------------|-------------|----------------|-------------|
|           |  | Remember                                     | Understand | Application |                |             |
| 1         | Plumbing Terminology.                          | 5  | 4          | 3           | CEG407-1       | 12          |
| 2         | Plumbing fixtures and fixture fittings.        | 4  | 5          | 5           | CEG407-2       | 14          |
| 3         | Traps, interceptors, indirect waste and vents. | 3  | 4          | 7           | CEG407-3       | 14          |
| 4         | Sanitary drainage and storm drain.             | 6  | 6          | 8           | CEG407-4       | 20          |
| 5         | Water Supply, Gray and Reclaimed Water.        | 5  | 6          | 9           | CEG407-5       | 20          |
| TOTAL     |  | 23   | 25         | 32          |                | 80          |

(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                              | Topic                            |
|----|---|----------------------------------|
| 1. | Field Visits                                  | Every chapter of theory syllabus |
| 2. | Collecting data for seminar and micro project | Practical/Exercise               |

**ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION**

**I) Assessment Criteria for Practical/Exercise Work:**

**i) Continuous Assessment of practical/Exercise Work:**

Every practical assignment shall be assessed for 25 marks as per following criteria:

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**ii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* of 50 marks shall be conducted marks awarded in oral mark sheet as per *Assessment Pro-forma IV*.

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20 of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning**.

**Suggested Micro-projects:**

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students are to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant proforma. A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by concerned faculty.

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. VDO presentations
4. Question Bank

**REFERENCE MATERIAL :**

**Books / Journals / IS Codes / Websites**

**a) Reference Books:**

| Sr. No. | Author  | Title  | Publisher                     |
|---------|---|--|-------------------------------|
| 1.      | S. M. Patil                                       | Plumbing Engineering                                     | SeemaPublication ,<br>Mumbai. |
| 2.      | S. G. Deolalikar                                  | Plumbing Design and Practice                             | Tata McGraw-Hill              |
| 3.      | Lee Smith   | Plumbing Technology Design and Practice                  | Delmar Publication            |
| 4.      | James C. Church                                   | Practical Plumbing Design Guide                          | Mgraw-Hill (T)                |
| 5.      | Michal Casey,<br>DuglasHannes ,<br>Redwood Kardon | Plumbing and Illustrated Guide to the<br>Plumbing codes. |                               |

**b) Codes of Practice: IS, BIS and international codes:**

1. 2008 Uniform plumbing code – India (UPC-I)
2. 2008 Illustrated training manual (ITM).
3. Extracts from IAPMO India

**c) Websites:**

- 1) [www.plumbing services.com](http://www.plumbing services.com).
- 2) [www.cookandlees.com](http://www.cookandlees.com)
- 3) [www.mepdesignservices.com](http://www.mepdesignservices.com)
- 4) [www.plumbing.1800anytyme.com](http://www.plumbing.1800anytyme.com)
- 5) [www.dyno.com/plumbing](http://www.dyno.com/plumbing)

\* \* \*

**COURSE ID:**

**Course Name** : Quality Control  
**Course Code** : CEG408  
**Course Abbreviation** : GQCO

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : Nil

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 3            | 5       |
| Practical        | 2            |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                       |  | Term End Examination |                    | Total |
|-----------------------|--|--|----------------------|--------------------|-------|
|                       | Theory   | Practical                              | Theory               | Oral               |       |
| Details of Evaluation | Average of Two tests of 20 marks each (1 hour duration each) | One Progressive Skill Test of 25 marks | One paper (3 hours)  | As per proforma IV |       |
| Marks                 | 20   | ---                                    | 80                   | 25 I*              | 125   |

\*(To be assessed by internal examiner) \*\* (To be assessed by internal and external examiner)

**RATIONALE:**

The entire construction activities are ultimately judged by the achievement of specified quality standards. Hence clear understanding of the concepts, principles and practices of Quality Control are necessary.

It has now become evident that, in common with other majority management functions, successful conduct of the Quality function demands much specialized knowledge and many specialized tools and apply the knowledge. This subject is planned to enable the students to acquire this specialized knowledge and to develop proficiency in use of the tools and methods to make the knowledge effective.

**COMPETENCY**

Applying knowledge of components of Quality Control program for development of Infrastructure

**Cognitive:** Understanding and applying knowledge of Quality Control

**Psychomotor:** i) conduct under construction site visits.

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation



**COURSE OUTCOMES:**

**Course Outcome CEG408-1** Decide the steps in quality control program and plan the quality circles

**Course Outcome CEG408-2** Classify the data and present the data in different manners

**Course Outcome CEG408-3** Decide the Organization structure and ISO standards

**Course Outcome CEG408-4** Prepare the plan for inspection and sampling of construction works

**Course Outcome CEG408-5** Decide factors controlling Quality of conformance

**Course Outcome CEG408-6** Decide the applicability of Total quality management system in construction Project

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”:no correlation]

| Competency and COs  | Programme Outcomes POs and PSOs                  |                          |  |  |   |                            |                             |                         |                                      |                                  |
|---|--|--------------------------|--|--|---|----------------------------|-----------------------------|-------------------------|--------------------------------------|----------------------------------|
|   | PO 1<br>Basic knowledge and Discipline Knowledge | PO 2<br>Problem Analysis | PO 3<br>Design /Development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering Practices for society, sustainability and environment | PO 6<br>Project Management | PO 7<br>Life- long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency: Applying knowledge of Quality Control for development of Infrastructure :</b>        | 3  | 3                        | 3  | 2  | 3   | 2                          | -                           | 3                       | 3                                    | 1                                |
| <i>CEG408-1</i> Decide the steps in quality control program and plan the quality circles            | 3  | 3                        | 3  | 3  | 2   | 3                          | 1                           | 2                       | 2                                    | 1                                |
| <i>CEG408-2</i> Classify the data and present the data in different manners.                        | 3  | 3                        | 3  | 1  | 1   | 1                          | -                           | 3                       | 3                                    | 1                                |
| <i>CEG408-3</i> Decide the Organization structure and ISO standards                                 | 3  | 2                        | 2  | 2  | 2   | 2                          | 2                           | 2                       | 2                                    | 1                                |
| <i>CEG408-4</i> Prepare the plan for inspection and sampling of construction works                  | 3  | 3                        | 2  | 2  | 3   | 2                          | 3                           | 2                       | 2                                    | 1                                |
| <i>CEG408-5</i> Decide factors controlling Quality of conformance                                   | 3  | 2                        | 1  | 1  | 2   | 3                          | 3                           | 2                       | 2                                    | 1                                |
| <i>CEG408-6</i> Decide the applicability of Total quality management system in construction project | 3  | 2                        | 2  | 2  | 2   | 3                          | 3                           | 2                       | 2                                    | 1                                |

## PRACTICALS/EXERCISES

### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:  
Practical work is divided in three parts as below –

- A) Seminar and report.
- B) Site visits.
- C) Micro Projects

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed  | Course Outcome   |
|--------|---|--|--|
| A      | <p><b>Seminar:</b><br/>Students can select any topic from contents by text book, professional magazines, technical papers published and websites of. Make a seminar presentation of 10 minutes using power point and make a report. Weightage is assigned for contents and presentation skills. (Students can work in a group of two.)</p>  | <ol style="list-style-type: none"> <li>1. Developing Self learning ability.</li> <li>2. Developing Presentation skills.</li> </ol>   | <p>CEG408-1<br/>CEG408-2<br/>CEG408-3<br/>CEG408-4<br/>CEG408-5<br/>CEG408-6</p> |
| B      | <p><b>Visits and detailed Report</b><br/>1. To collect data of construction work and plot frequency distribution, histogram, polygon and cumulative frequency.<br/>2. To inspect different items of construction work.<br/>3. To study the sampling plan of any one Civil Engineering construction.</p>   | <ol style="list-style-type: none"> <li>1. Time management, team working.</li> <li>2. Understand, prepare and interpret the drawings related to work.</li> <li>3. Understand the procedure for inspection of different items of construction work.</li> </ol> | <p>CEG408-2<br/>CEG408-6</p>   |
| C      | <p><b>Suggested Micro-projects:</b><br/><b>Any one project for group of three to five students.</b><br/>1. Visit any construction industry and list the quality control practices.<br/>2. The study of steps in quality control programme, objectives and quality characteristics.<br/>3. The study of quality circle, advantages and limitations of basic organization structure of any one construction organization<br/>4. To study various functions of quality control department and study job specifications regarding quality.<br/>5. To study the different features of ISO 9000<br/>6. To study various tools of TQM.</p> | <ol style="list-style-type: none"> <li>1. Information collection and presentation in the form of report.</li> <li>2. Motivation through field exposure.</li> <li>3. Developing self learning ability.</li> </ol>   |  |

**CONTENT: THEORY**

**Section I**

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b>Course Outcome CEG408-1 Decide the steps in quality control program and plan the quality circles</b> |  |                  |                         |
| 1   | <p><b>Introduction</b></p> <p><b>1.1 Basic Concepts Definition, Terminology</b></p> <p>1.1.1 Meaning of Quality - Meaning of quality control</p> <p>1.1.2 Steps in quality control program.</p> <p>1.1.3 Objectives of quality control, quality characteristics</p> <p>1.1.4 Quality of design, factors controlling of Quality of design.</p> <p><b>1.2 Quality Circle</b></p> <p>1.2.1 Definition ,</p> <p>1.2.2 Scope of quality circles, advantages and limitations of quality circles</p> <p>1.2.2 Basic organizational structure of quality circles ,</p> <p>1.2.4 Basic problem solving techniques (Brain storming )</p> | 11               | 18                      |
| <b>Course Outcome CEG408-2 Classify the data and present the data in different manners</b>              |  |                  |                         |
| 2   | <p><b>Fundamentals of statistical concepts</b></p> <p>2.1 Frequency, Frequency distribution, frequency plot, use of Frequency plot-case study, classification of data.</p> <p><b>2.3</b> Graphic presentation of frequency distribution i.e. histogram, polygon, cumulative frequency graph etc. presenting the data.</p> <p>2.4 Concept of universe and sample statistics normal distribution curve, its construction, actual and ideal normal distribution curve.</p> <p>2.5. Measures of central tendency i.e. Arithmetic mean, The median, the mode comparison of mean mode and median.</p>                                | 07               | 10                      |
| <b>Course Outcome CEG408-3 Decide the Organization structure and ISO standards</b>                      |  |                  |                         |
| 3   | <p><b>Organization structure and ISO standards</b></p> <p><b>3.1 Organization For Quality Control</b></p> <p>3.1.1 Quality control Department, Structure of the Department,</p> <p>3.1.2 Staffing and job specifications,</p> <p><b>3.2 Introduction To ISO 9000.</b></p> <p>3.2.1 Introduction to ISO series ,History of ISO 9000 series standards,</p>   | 6                | 12                      |

|  |   |           |           |
|--|---|-----------|-----------|
|  | 3.2.2 ISO 9000 standards in general ,Outstanding features of ISO 9000<br>3.2.3 Series of standards ,<br>3.2.4 Benefits by becoming an ISO 9000 company. |           |           |
|  | <b>Total</b>  | <b>24</b> | <b>40</b> |

## Section II

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b><i>Course Outcome CEG408-4 Prepare the plan for inspection and sampling of construction works</i></b>  |  |                  |                         |
| <b>4</b>  | <b>Inspection and Sampling</b><br><b>4.1 Inspection</b><br>4.1.1 Importance of inspection& types, inspection of works in construction,<br>4.1.2 Inspection planning, accuracy of inspection<br>4.1.3 Budgeting for inspection & approaches to reduce the inspection cost.<br><br><b>4.2 Sampling by Attributes</b><br>4.2.1 Importance of sampling inspection, acceptance sampling<br>4.2.2 Lot formation, terminology of sampling plans - single, double, multiple, sequential.<br>4.2.3 Procedure of lot acceptability, normal reduced&tightened inspection.<br>4.2.4 Design of sampling plans | <b>12</b>        | <b>20</b>               |
| <b><i>Course Outcome CEG408-5 Decide factors controlling Quality of conformance</i></b>   |  |                  |                         |
| <b>5</b>  | <b>Quality Assurance</b><br>5.1 Concept of quality assurance<br>5.2 Responsibilities of quality assurance<br>5.3 Quality audit<br>5.4 Quality of conformance, factors controlling Quality of conformance.  | <b>6</b>         | <b>10</b>               |
| <b><i>Course Outcome CEG408-6 Decide the applicability of Total quality management system in construction project</i></b>   |  |                  |                         |
| <b>6</b>  | <b>Total quality management</b><br>6.1 Historical review and evolution of TQM<br>6.2 Deming and Juran approaches to TQM<br>6.3 Seven tools of TQM<br>6.4 Total quality culture<br>6.5 Bench marking, quality function deployment, Kaizen, six sigma  | <b>6</b>         | <b>10</b>               |
|   | <b>Total</b>   | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                         |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                        | Distribution of marks<br>(Cognitive level-wise) |            |                   | Course Outcome | Total Marks |
|-----------|--------------------------------------|---|------------|-------------------|----------------|-------------|
|           |                                      | Remember  | Understand | Applica-<br>-tion |                |             |
| 1         | Introduction                         | 8   | 6          | 4                 | CEG408-1       | 18          |
| 2         | Fundamentals of statistical concepts | 4   | 2          | 4                 | CEG408-2       | 10          |
| 3         | Organization structure and ISO       | 6   | 6          | -                 | CEG408-3       | 12          |
| 4         | Inspection and Sampling              | 8   | 8          | 4                 | CEG408-4       | 20          |
| 5         | Quality assurance                    | 4   | 4          | 2                 | CEG408-5       | 10          |
| 6         | Total quality management             | 4   | 4          | 2                 | CEG408-6       | 10          |
| Total     |                                      | 34  | 30         | 16                |                | 80          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

| SN | Mode of Exposure                              | Topic                            |
|----|---|----------------------------------|
| 1. | Field Visits                                  | Every chapter of theory syllabus |
| 2. | Collecting data for seminar and micro project | Practical/Exercise               |

**INDUSTRIAL EXPOSURE :**

**ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION**

- **Assessment Criteria for Practical/Exercise Work:**

**i) Continuous Assessment of practical/Exercise Work:**

Every assignment shall be assessed for 25 marks as per following criteria:

| Domain       | Particulars                            | Marks out of 25 |
|--------------|--|-----------------|
| Cognitive    | Understanding                          | 05              |
|              | Application                            | 05              |
| Psychomotor  | Operating Skills                       | 05              |
|              | Drawing / drafting skills/presentation | 05              |
| Affective    | Discipline and punctuality             | 05              |
| <b>TOTAL</b> |  | <b>25</b>       |

**iii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted and Final marks shall be awarded as per *Assessment Pro-forma IV*.

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20 of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

**Suggested Micro-projects:**

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students are to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma. A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by concerned faculty.

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. VDO presentations
4. Question Bank

**REFERENCE MATERIAL:**

**Books / Journals / IS Codes**

**a)Reference Books:**

| <b>Sr. No.</b> | <b>Author</b>                   | <b>Title</b>  | <b>Publisher</b>   |
|----------------|---------------------------------|---|--------------------|
| 1              | J .M .Juras&Frank<br>M .GrynaJr | Quality planning and Analysis                       |                    |
| 2              | T .T .T .I .Madras              | Quality control                                     | T .T .T .I .Madras |
| 3              | S .Dalesa&Saurabh               | ISO 9000 Quality systems.                           |                    |
| 4              | T.R.Banga,<br>S.C.Sharma        | Industrial organization and<br>industrial economics | Khanna Publishers  |

**COURSE ID:**

**Course Name** : TOWN AND COUNTRY PLANNING  
**Course Code** : CEG409  
**Course Abbreviation** : GTCP

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s)** : <nil >

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 05      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |  | Term End Examination            |                    | Total |
|-----------------------|---------------------------------------|--|---------------------------------|--------------------|-------|
|                       | Theory                                | Practical  | Theory Examination              | OR*                |       |
| Details of Evaluation | Average of two tests of 20 marks each | 1. 25 marks for each practical<br>2. One PST of 25 marks | Term End Theory Exam (03 hours) | As per Proforma-IV |       |
| Marks                 | 20                                    | --   | 80                              | 25 I               | 125   |

**RATIONALE:**

The civil engineering branch has great responsibility to protect the environment and to distribute the nature's gifts to all in a rational manner. In this context the student shall have the knowledge of available basic resources like land, water, light, air. It is ultimate responsibility of the planner to see that any resource is not over stretched or over consumed. The student / planner have to consider socio-economic structure of the region. Understanding interdependency of regions and the environment, he should be able to suggest draft plan for future, keeping in view the healthy atmosphere and room for expansion to all components.

**COMPETENCY**

Apply principles of town planning and bye-laws of local authority for a town and rural planning as follows:

**Cognitive:** Understanding and applying principles of town planning for a town and rural planning.

**Psychomotor:** i) Carrying field survey to collect data ii) Planning of town and rural area

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation



**COURSE OUTCOMES:**

**CEFG410-1** Plan the town using basic town planning principles and Carry field survey to collect various data.

**CEG409-2** Work to improve slum areas, select the ideal site for industries, public buildings, provide Facilities like parks and playgrounds.

**CEG409-3** Plan residential area using neighbourhood concept

**CEG409-4** Plan the region as per MR&TP act

**CEG409-5** Plan the buildings as per building bye laws of local authority

**CEG409-6** Plan and design rural housing at low cost

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”: no correlation]

|  | PO 1<br>Basic &<br>Discipline<br>specific<br>knowledge | PO 2<br>Problem<br>analysis | PO 3<br>Design/development of<br>solutions | PO 4<br>Engineering<br>Tools,<br>Experimentation &<br>Testing | PO 5<br>Engineering<br>practice for<br>society,<br>sustainability<br>&<br>environment | PO 6<br>Project<br>management | PO 7<br>Life-<br>long<br>learning | PSO1<br>Plan<br>and<br>Design | PSO2<br>Construction<br>and<br>Maintenance | PSO3<br>Problem<br>Solving on<br>field |
|--|--|-----------------------------|--|---|---|-------------------------------|-----------------------------------|-------------------------------|--|--|
| <b>Competency:</b> Apply principles of town planning and bye-laws of local authority for a town and rural planning as follows                      | 3  | 3                           | 3  | 2   | 2   | -                             | -                                 | 2                             | 2  | 1                                      |
| <b>CEG409-1</b> Plan the town using basic town planning principles & and Carry field survey to collect various data.                               | 3  | 3                           | -  | -   | 2   | -                             | -                                 | 1                             | 1  | 1                                      |
| <b>CEG409-2</b> Work to improve slum areas, select the ideal site for industries, public buildings, provide facilities like parks and playgrounds. | 2  | 3                           | 3  | 2   | 3   | 2                             | -                                 | 2                             | 2  | 1                                      |
| <b>CEG409-3</b> Plan residential area using neighbourhood concept.   | 3  | 3                           | 2  | 2   | 2   | -                             | -                                 | 2                             | 2  | 1                                      |
| <b>CEG409-4</b> Plan the region as per MR&TP act   | 3  | 3                           | 2  | 1   | 3   | -                             | -                                 | 2                             | 2  | 1                                      |
| <b>CEG409-5</b> Plan the buildings as per building bye laws of local authority   | 3  | 3                           | 2  | 2   | 3   | 2                             | -                                 | 2                             | 2  | 1                                      |
| <b>CEG409-6</b> Plan and design rural housing at low cost  | 3  | 3                           | 3  | 2   | 2   | 2                             | -                                 | 2                             | 2  | 1                                      |

**A) Practical Exercises and related skills to be developed :**

The following practical exercises shall be conducted:

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed  | Course Outcome  |
|--------|---|--|---|
| A      | <b>Practical Exercise</b>   |  |   |
|        | 1   | Land sub divisioning problem   | 1. Data collection & presentation skills<br>CEG409-1                                |
|        | 2   | Planning of housing scheme leading to detailed neighborhood planning   | 2. Planning of housing scheme as per neighborhood principles<br>CEG409-4            |
|        | 3   | Case studies of town planning schemes having report and drawing  | 1. Studying MR & TP act, planning town planning schemes<br>CEG409-5                 |
|        | 4   | Collection of building bye-laws of local authority   | 1. Planning of all buildings as per local bye laws<br>CEG409-6                      |
|        | 5   | Parking bye laws for different types of public buildings   | Studying parking space required for different types of public buildings<br>CEG409-6 |
| B.     | <b>Seminar</b><br>Students can select any topic from contents by text book, professional magazines, technical papers published and websites of. Make a seminar presentation of 10 minutes using power point and make a report. Weightage is assigned for contents and presentation skills. (Students can work in a group of two.)   | 1. Developing Self learning ability.<br>2. Developing Presentation skills.   | CEG409-2<br>To<br>CEG409-6  |
| C.     | <b>Suggested Micro-Projects</b><br><b>Any one project for group of three to five students.</b><br>1. Collect the information of, “DeenDayal Upadhyaya Grameen Kaushalya Yojana” and prepare a report on it with reference to the nearby village or rural settlement.<br><br>2. Summarize the salient features of the National Rural Employment Guarantee Act, 2005 (NREGA) that has been executed successfully for the given rural area and present the same in the form of the report. | 1. Information collection and presentation in the form of report.<br><br>2. Motivation through field exposure.<br><br>3. Developing self learning ability. |   |

**B) CONTENT : THEORY :**

**Section I**

| <b>Sr. No.</b>   | <b>Topics / Sub-topics</b>   | <b>Lectures (Hours)</b> | <b>Theory Evaluation (Marks)</b> |
|--|--|-------------------------|----------------------------------|
| <b>CEG409-1</b> Plan the town using basic town planning principles and Carry field survey to collect various data.   |  |                         |                                  |
| <b>1</b>   | <p><b>Introduction</b></p> <p>1.1 Meaning and scope of the subject.<br/>1.2 Evolution of town planning.<br/>1.3 Objects of town planning<br/>1.4 Principles of town planning<br/>1.5 Growth of towns –concentric, satellite, Ribbon develop, etc</p> <p><b>Nature and purpose of town and country planning</b></p> <p>1.6 Forms of town and country planning. i .e local planning, country planning, regional planning, national planning, international planning,<br/>1.7 Various types of surveys. i.e. Town or city survey, Regional survey, National survey, Civil survey<br/>1.8 Zoning - Definition Types of zoning, Land use analysis.<br/>1.9 Landscape Architecture. – Objects and salient features of the landscape architecture.</p>  | <b>12</b>               | <b>16</b>                        |
| <b>Course Outcome CEG409-2</b> Work to improve slum areas, select the ideal site for industries, public buildings and provide facilities like parks and playgrounds. |  |                         |                                  |
| <b>2</b>   | <p><b>Various techniques and practice</b></p> <p>2.1 Introduction to 5 year plan<br/>2.2 Master plan – Definition, objects, necessity, Data to be collected, details to be shown on master plan drawings, steps/stages in the preparation of master plan<br/>2.3 Housing – Housing problem in India, classification of housing,<br/>2.4 Slums – Definition, Causes, effects of slums on town life, precautions to be taken against slum formation, slum clearances<br/>2.5 Industries – Classification of industries, selection of site for industries, planning of industrial estate<br/>2.6 Public Buildings - Grouping of public buildings in various categories, site selection of public buildings<br/>2.7 Parks and play grounds – Types of re-creation systems, various forms of recreation amenities i.e. type of parks and play grounds</p> | <b>08</b>               | <b>16</b>                        |

| <b>Course Outcome CEG409-3 Plan residential area using NH planning concept</b>  |  |           |           |
|---|--|-----------|-----------|
| <b>3</b>  | <b>Neighbour-hood planning</b><br>3.1 Concept and principles of NH planning<br>3.2 Importance of NH planning<br>3.3 Features of NH Planning<br>3.4 Agencies for housing schemes i.e. State Housing Board, Co-operative Housing Societies, Private Enterprises, Individuals, brief description of each. | <b>04</b> | <b>08</b> |
|   | <b>Total</b>   | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

## Section II

| <b>Sr. No.</b>  | <b>Topics / Sub-topics</b>   | <b>Lectures (Hours)</b> | <b>Theory Evaluation (Marks)</b> |
|---|--|-------------------------|----------------------------------|
| <b>Course Outcome CEG409-4 Plan the region as per MR &amp; TP act.</b>                        |  |                         |                                  |
| <b>4</b>  | <b>Law in relation to planning</b><br>4.1 Necessity of planning law and legislation<br>4.2 Existing legislation for clearance, development and control of urban land ( only list)<br>4.3 Land acquisition act (Introduction only)<br>4.4 Aims of land acquisition act<br>4.5 Planning legislation in Maharashtra state ( MR & TP act)<br>1. Categories of MR & TP act<br>i.e brief details like agency, functions contents, procedure etc.<br>4.6 Framework and functions of local authorities<br>4.7 Local authorities a) Village panchayat & panchayat samiti<br>b) Zilha Parishads c) Municipal councils (A,B,C,) class, Municipal Corporations | <b>08</b>               | <b>14</b>                        |
| <b>Course Outcome CEG409-5 Plan the buildings as per building bye-laws of local authority</b> |  |                         |                                  |
| <b>5</b>  | <b>Building bye-laws</b><br>5.1 Definition<br>5.2 Objects of bye-laws<br>5.3 Importance of bye-laws<br>5.4 Applicability of bye-laws<br>5.5 Set-back & light plane<br>5.6 Floor space index (FSI), Floating FSI- definition, explanation with one example<br>5.7 Off-street parking, Fire protection, minimum plot sizes   | <b>08</b>               | <b>14</b>                        |

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>Course Outcome CEG409-6 Plan and design rural housing at low cost</b>  |  |                  |                           |
| <b>6</b>  | <b>Planning of rural development</b><br>6.1 Village planning – Necessity, difference between rural & urban areas, types of villages.<br>6.2 Principles of village planning<br>6.3 General principles of rural housing design<br>6.4 Rural housing problem in India<br>6.5 Rural housing scheme<br>6.6 Introduction to low cost housing & agro industries | <b>08</b>        | <b>12</b>                 |
|   | <b>Total</b>   | <b>32</b>        | <b>40</b>                 |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                           |

**C) Specification table for setting question paper for semester end theory examination:**

| Topic No.    | Name of topic                    | Distribution of marks (Cognitive level-wise) |            |              | Course Outcome | Total Marks |
|--------------|----------------------------------|--|------------|--------------|----------------|-------------|
|              |                                  | Remember                                     | Understand | Applica-tion |                |             |
| 1            | Introduction                     | 04   | 08         | 04           | CEG409-1       | 16          |
| 2            | Various techniques and practices | 06   | 08         | 02           | CEG409-2       | 16          |
| 3            | Neighbourhood planning           | 02   | 04         | 02           | CEG409-3       | 08          |
| 4            | Law in relation to planning      | 06   | 08         | --           | CEG409-4       | 14          |
| 5            | Building bye-laws                | 04   | 06         | 04           | CEG409-5       | 14          |
| 6            | Planning of rural development    | 02   | 06         | 04           | CEG409-6       | 12          |
| <b>TOTAL</b> |                                  | <b>28</b>                                    | <b>40</b>  | <b>12</b>    |                | <b>80</b>   |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**D) INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure                     | Topic                            |
|----|--------------------------------------|----------------------------------|
| 1. | Field examples of course application | Every chapter of theory syllabus |
| 2. | Field examples of course application | Assignments & Microprojects      |

**ASSESSMENT CRITERIA FOR PRACTICAL EXAMINATION**

**j) Assessment Criteria :**

**i) Continuous Assessment of Practical Assignments:**

Every practical assignment shall be assessed for 50 marks as per following criteria:

| Domain       | Particulars                   | Marks out of 25 |
|--------------|-------------------------------|-----------------|
| Cognitive    | Understanding                 | 02              |
|              | Application                   | 03              |
| Psychomotor  | Carrying field work skills    | 05              |
|              | Planning town and rural areas | 05              |
| Affective    | Discipline and punctuality    | 05              |
|              | Decency and presentation      | 05              |
| <b>TOTAL</b> |                               | <b>25</b>       |

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 50 marks shall be conducted as per Proforma IV

Final marks of continuous assessment work shall be awarded as per *Assessment Pro-forma IV*.

**E) INSTRUCTIONAL STRATEGIES :**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .

**Suggested Micro-projects:**

*Only one micro-project* is planned to be undertaken by the student that needs to be assigned to him/her in the beginning of the semester. The groups of students are to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant proforma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

**F) Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**G) REFERENCE MATERIAL :**

**a) Books / Journals / IS Codes**

| Sr. No. | Author       | Title                              | Publisher                            |
|---------|--------------|------------------------------------|--------------------------------------|
| 1.      | G.H.Hiraskar | Fundamentals of town planning      | Dhanpatrai Publications<br>New Delhi |
| 2.      | S.C.Rangwala | Town Planning                      | Charotar Publishing<br>House - Anand |
| 3.      | N.K.Gandhi   | Study of town and country planning | -                                    |

**b) Websites**

[http://www.kolhapurcorporation.gov.in/english/Town\\_Planning\\_Department.html](http://www.kolhapurcorporation.gov.in/english/Town_Planning_Department.html)

<http://tcpo.gov.in/>

<https://dtp.maharashtra.gov.in/en>

\* \* \*

**LEVEL V**

**MANAGEMENT & DIVERSIFIED**

**TECHNOLOGY COURSES**



**COURSE ID :**

**Course Name** : Entrepreneurship and Start-ups  
**Course Code** : CCG501  
**Course Abbreviation** : GESU

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : Nil

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 02           | 04      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |   | Term End Examination |           |                             | Total     |
|-----------------------|---------------------------------------|---|----------------------|-----------|-----------------------------|-----------|
|                       | Theory                                | Practical   | Theory Examination   | Term Work | Oral Examination (Internal) |           |
| Details of Evaluation | Average of two tests of 20 marks each | ii. 25 marks for each practical<br>iii. One PST of 25 marks | --                   | --        | *As per Proforma-IV         |           |
| Marks                 | --                                    | --  | --                   | --        | <b>50 I</b>                 | <b>50</b> |

\* Assessment as per pro-forma-IV

I– Internal Examination

**RATIONALE:**

Globalization, liberalization and Privatization along with revolution in information technology have opened up new opportunities transforming lives of masses. In this context, there is an immense opportunity of establishing manufacturing, service, trading, marketing and consultancy enterprises by diploma engineer, Our fast growing economy provides ample scope for diploma engineers to succeed as an entrepreneur. Entrepreneurship requires distinct skill sets which are attempted to be developed through this course. To begin with, this course aims to develop the competency and the related outcomes in order to start small enterprises.

**COMPETENCY:**The aim of this course is help the students to attain the following industry identified competency through various teaching & learning experiences:

**Cognitive:** i) Understanding and applying principles and labor laws ii) Observing iii) Classifying iv) Interpreting

**Psychomotor:** Man power handling.

**Affective:** i) Follow the safe practices, ii) Practice good housekeeping iii) Maintain tool and equipment

**COURSE OUTCOMES:**

**CCG501-1:** Identify your entrepreneurial attributes

**CCG501-2:** Identify the business opportunities that suits you

**CCG501-3:** Use the support systems to zero down to your business idea.

**CCG501-4:** Develop comprehensive business plans.

**CCG501-5:** Prepare plans to manage the enterprise effectively.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos  | Programme Outcomes POs and PSOs                 |                          |  |  |   |                            |                            |      |      |
|---|---|--------------------------|--|--|---|----------------------------|----------------------------|------|------|
|   | PO 1<br>Basic and Discipline Specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solution | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>The engineering Practices for society, Sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1 | PSO2 |
| <b>Competency:</b> The aim of this course is help the students to attain the following industry identified competency | --  | 2                        | 3  | 2  | 3   | 3                          | 2                          | 3    | 3    |
| <b>CCG501-1</b> Identify your entrepreneurial traits.   | ---   | 2                        | --                                       | --   | 2   | --                         | 1                          | --   | --   |
| <b>CCG501-2</b> Identify the business opportunities that suits you  | ---   | 2                        | --                                       | --   | 2   | --                         | 1                          | --   | --   |
| <b>CCG501-3</b> Use the support systems to zero down to your business idea.   | --  | 2                        | 2  | 1  | -   | 2                          | 2                          | --   | 2    |
| <b>CCG501-4</b> Develop comprehensive business plans.   | --  | --                       | 3  | 2  | 3   | -                          | 2                          | 2    | 3    |
| <b>CCG501-5</b> Prepare plans to manage the enterprise effectively.   | --  | --                       | 3  | -  |   | 2                          | 3                          | 2    | 3    |

**CONTENT:**

i. **PRACTICLAS / EXERCISES:**

The practicals in these sections are the sub components of the COs to be developed and assessed in the students for the attainment of the competency.

| Sr. No. | Practical Outcomes (PrOs)   | Unit Nos. | Approx Hrs. Required |
|---------|---|-----------|----------------------|
| 1       | Submit a profile summary (about 500 words) of a successful entrepreneur indicating milestone achievement.   | I         | 02*                  |
| 2       | Undertaking SWOC analysis to arrive at your business idea of a product / service.   | I         | 02                   |
| 3       | General business ideas (product / service) for intrapreneurial and entrepreneurial opportunities through brainstorming.   | II        | 02                   |
| 4       | Undertake self-assessment test to discover your entrepreneurial opportunities.  | II        | 02*                  |
| 5       | Identify business opportunities/self-employments are as suitable for you.   | II        | 02                   |
| 6       | Survey industries of your stream; grade them according to the level of scale of production, investment, turnover, pollution to prepare a report on it.                          | II        | 02                   |
| 7       | Visit a bank/Financial institution to enquire about various funding schemes for small scale enterprise.   | III       | 02*                  |
| 8       | Collect loan application forms of national banks/other financial institutions.  | III       | 02*                  |
| 9       | Compile the information from financial agencies that will help you set up your business enterprise.   | III       | 02*                  |
| 10      | Compile the information from government agencies that will help you set up your business enterprise.  | III       | 02*                  |
| 11      | Prepare Technological feasibility report of a chosen product/service.   | III       | 02*                  |
| 12      | Prepare a set of short term, medium and long term goals for starting a chosen small scale enterprise.   | III       | 02*                  |
| 13      | Prepare marketing strategy for your chosen product/service.   | IV        | 02*                  |
| 14      | Compile the information about insurance schemes covering different risk factors.  | IV        | 02                   |
| 15      | Find the breakeven point for the business idea chosen by you.   | V         | 02                   |
| 16      | Prepare a business plan for your chosen small scale enterprise.   | V         | 02*                  |
| 17.     | Organize funfair for your class and write report of profit/loss.  | V         | 02                   |
| 18.     | Visit report of any industry: Brief history, types and details of services/support assistance being given, any other information which is useful to self-employer/entrepreneur. | V         | 02                   |

**Note:** A judicious mix of minimum 12 or more practical need to be performed, out of which, the

Practical's marked as '\*' are compulsory, so that the student reaches the 'Precision Level of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.

The above practical Outcomes also comprise the following social skills/attitudes which are Affective Domain Outcomes that are best developed through the laboratory/field based experiences:

- a. Follow safe practices
- b. Good housekeeping practices
- c. Practice energy conservation
- d. Demonstrate working as a leader/a team member
- e. Maintain tools and equipments
- f. Follow ethical practices

The Affective Domain Outcomes are not specific to any one Practical Outcomes, but are embedded in many Practical Outcomes. Hence, the acquisition of the Affective Domain Outcomes takes place gradually in the students when he/she undertake a series of practical experiences over a period of time.

**ii) THEORY:**

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) |
|---|--|------------------|
| <b>CCG501-1: Identify your entrepreneurial attributes</b>           |  |                  |
| <b>1</b>  | <p><b>Entrepreneurship Development- Concept and Scope</b></p> <p>1.1 Concepts and Overview of Entrepreneurship. Evolution and Growth of Entrepreneurship in India. Role of Entrepreneurship in Economic Development. Entrepreneurship as a career.</p> <p>1.2 Traits of successful intrapreneur / entrepreneur:<br/>Consistency, creativity, initiative, independent decision making, assertiveness, persuasion, persistence, information seeking,</p> <p>1.3 Entrepreneurship: Scope in local and global market.</p> <p>1.4 Intrapreneur and entrepreneur.</p> <p>1.5 Types of enterprises and their features: Manufacturing, Service and trading.</p> <p>1.6 Steps in Setting up of a business</p> | <b>06</b>        |
| <b>CCG501-2: Identify the business opportunities that suits you</b> |  |                  |

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) |
|---|--|------------------|
| 2   | <p><b>Entrepreneurial Opportunities and Selection Process:</b></p> <p>2.1 Product / Service selection: Process, core competence, product / service life cycle, new product / service development process, mortality curve, Creativity and innovation in product / Service modification / development.</p> <p>2.2 Process selection: Technology life cycle, forms and cost of transformation, Factors affecting process selection, Location for an industry, Material handling.</p> <p>2.3 Market study procedures: Questionnaire design, sampling, Market survey, Data analysis</p> <p>2.4 Getting information from concerned stake holders such as Maharashtra Centre for Entrepreneurship Development (MCED), National Institute for Micro, Small and Medium Enterprises (NI-MSME, Prime Minister Employment Generation Program (PMEGP), Directorate of Industries (DI), Khadi Village Industries Commission (KVIC).</p> | 08               |
| <p><b>CCG501-3:</b> Use the support systems to zero down to your business idea.</p> |  |                  |
| 3   | <p><b>Support Systems:</b></p> <p>3.1 Categorization of MSME, Ancillary Industries. .</p> <p>3.2 Support <b>system</b>-Government Agencies: MCED, NI- MSME, PMEGP, DI, KVIC.</p> <p>3.3 Support agencies for entrepreneurship guidance, training, registration, technical consolation, technology transfer and quality control, marketing and finance</p> <p>3.5 Breakeven point, return of investment and return on sales.</p>  | 06               |
| <p><b>CCG501-4:</b> Develop comprehensive business plans.</p>                       |  |                  |
| 4   | <p><b>BUSINESS PLAN PREPARATION:</b></p> <p>4.1 Sources of Product for Business: Feasibility study.</p> <p>4.2 Ownership, Capital, Budgeting, Matching Entrepreneur with the project, Feasibility Report preparation and evaluation criteria.</p> <p>4.3 Business plan preparation.</p>  | 06               |

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) |
|--|--|------------------|
| <b>CCG501-5:</b> Prepare plans to manage the enterprise effectively. |  |                  |
| <b>5</b>   | <b>Managing Enterprise:</b><br>5.1 Unique Selling proposition (U.S.P.): Identification, Developing a marketing plan.<br>5.2 Preparing Strategies of handling Business: Policy making, negotiation and bargaining techniques.<br>5.3 Risk management: planning for calculated risk taking, initiation with low cost projects, integrated futuristic planning, angel investors, venture capitalist.<br>5.4 Incubation centers: Role and procedure. | <b>06</b>        |

**Performance Indicator: -**

| Sr. No.      | Performance Indicators       | Weightage in % |
|--------------|------------------------------|----------------|
| 1            | Leadership Skills            | 20             |
| 2            | Team Work                    | 20             |
| 3            | Lateral / Creative Thinking  | 10             |
| 4            | Observation and Recording    | 10             |
| 5            | Self-learning                | 20             |
| 6            | Answer the simple questions  | 10             |
| 7            | Submission of report on time | 10             |
| <b>Total</b> |                              | <b>100</b>     |

**MAJOR EQUIPMENTS/INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will user in uniformity in conduct of experiments, as well as aid to procedure equipment by authorities concerned.

| Sr. No. | Equipment Name with Broad Specifications                                       | PrO. No. |
|---------|--|----------|
| 1       | Seminar Hall equipped with conference table, chairs and multimedia facilities. | All      |
| 2       | Modern Desktop Computer with internet connection.                              | All      |

### SUGGESTED STUDENT ACTIVITY –Under Micro-Project

Other than the classroom and laboratory learning, following are the suggested student related Co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare report of about 5 pages for each activity, also collect/record physical evident for their (student’s) portfolio which will be useful for their placement interviews:

- a. Download product development and innovative films from internet.
- b. Prepare collage for “Traits of Successful entrepreneurs”
- c. Identify your hobbies and interests and convert them into business idea.
- d. Convert your project work into business.
- e. Decide any product and analyze its good and bad features.
- f. Choose any product and study its supply chain.
- g. Visit industry exhibitions, trade fairs and observe nitty-gritty of business.
- h. Perform a survey and identify local resources available for setting up of an enterprise.
- i. Conduct a market survey for a project. Collect data on machinery specifications, price, output/hr, power consumption, manpower requirement, wages, raw material requirement, specification, competitor’s product price, features, dealer commissions, and marketing mix.
- j. Prepare a business plan and organize a business plan competition.

### SUGGESTED LEARNING RESOURCES

| Sr. No. | Title of Books  | Author                 | Publication   |
|---------|---|------------------------|---|
| 1       | The entrepreneurial Instinct: How Everyone Has the Innate Ability to Start a Successful Small Business. | Mehta, Monica          | McGowan-Hill Education, New Delhi, 2012,ISBN 978-0-07-179742-9                                    |
| 2       | Entrepreneurship  | Hisrich R. D.          | McGowan-Hill Education, New Delhi, 2013,ISBN-13: 978-1259001635                                   |
| 3       | Part I Readings in Entrepreneurship Education   | Sareen S.B.            | Entrepreneurship Development Institute of India (EDI), GOI, Ahmedabad, 2016; ISBN: 978-0078029169 |
| 4       | Reading Materials of Entrepreneurship Awareness Camp  | Gujral, Raman          | Entrepreneurship Development Institute of India (EDI), GOI, Ahmadabad                             |
| 5       | Product Design and manufacturing  | Chitale A.K.           | PHI Learning, New Delhi,2014; ISBN: 9788120348738   |
| 6       | Entrepreneurship Development Small Business Entrepreneurship  | Charantimath, Poornima | Pearson Education India, New Delhi; ISBN: 9788131762264   |

|   |   |               |   |
|---|---|---------------|---|
| 7 | Entrepreneurship Development: Special Edition for MSBTE | CPSC, Manila  | Tata McGraw Hill, New Delhi                           |
| 8 | Entrepreneurship Development Small Business Management  | Khanka S. S.  | S. Chand and sons, New Delhi, ISBN: 978-93-5161-094-6 |
| 9 | Entrepreneurship Development                            | S. Anil Kumar | New Age International, New Delhi, ISBN: 9788122414349 |

### SUGESTED SOFTWARE/LEARNING RESOURCES

| Sr. No | SOFTWARE/LEARNING RESOURCES   | LINKS   |
|--------|---|---|
| 1      | MCED Book Links   | <a href="http://www.mced.nic.in/UdyojakSpecial.aspx?linktype=Udyojak">http://www.mced.nic.in/UdyojakSpecial.aspx?linktype=Udyojak</a>   |
| 2      | MCED Product and Plan Details   | <a href="http://www.mced.nic.in/allproduct.aspx">http://www.mced.nic.in/allproduct.aspx</a>   |
| 3      | The national Institute for Entrepreneurship and Small Business Development Publications | <a href="http://www.mced.nic.in/Publications.html">http://www.mced.nic.in/Publications.html</a>   |
| 4      | Courses: The National Institute of Small Business Development Publication               | <a href="http://niesbud.nic.in/docs/1standardized.pdf">http://niesbud.nic.in/docs/1standardized.pdf</a>   |
| 5      | Entrepreneur.com  | <a href="http://www.entrepreneur.com/lists">http://www.entrepreneur.com/lists</a>   |
| 6      | GOVERNMENT SPONSORED SCHEMES  | <a href="http://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530">http://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530</a>   |
| 7      | NABARD- Information Centre  | <a href="http://www.nabard.org/Tenders.aspx?cid=501andid=24">http://www.nabard.org/Tenders.aspx?cid=501andid=24</a>   |
| 8      | NABARD – What we do   | <a href="http://www.nabard.org/content1.aspx?id=8andcatid=8andmid=488">http://www.nabard.org/content1.aspx?id=8andcatid=8andmid=488</a>   |
| 9      | Market Review   | <a href="http://www.businesstoday.in/markets">http://www.businesstoday.in/markets</a>   |
| 10     | Start Up India  | <a href="http://www.startupindia.gov.in/pdf/file.php?title=Sartup%20India%20Action%20Planandtype=Actionandq=Action%20Plan.pdfandcontent_type=Actionandsubmenupoint=action">http://www.startupindia.gov.in/pdf/file.php?title=Sartup%20India%20Action%20Planandtype=Actionandq=Action%20Plan.pdfandcontent_type=Actionandsubmenupoint=action</a> |
| 11     | About – Entrepreneurship Development Institute of India (EDII)                          | <a href="http://www.ediindia.org/institute.html">http://www.ediindia.org/institute.html</a>   |
| 12     | EDII –Centres   | <a href="http://www.ediindia.org/centres.html">http://www.ediindia.org/centres.html</a>   |
| 13     | EDII – Publications   | <a href="http://www.ediindia.org/publication.html">http://www.ediindia.org/publication.html</a>   |
| 14     | Business Plan: A Step-By-Step Guide   | <a href="http://www.entrepreneur.com/article/247574">http://www.entrepreneur.com/article/247574</a>   |
| 15     | The National Science and Technology Entrepreneurship Development Board (NSTEDB)         | <a href="http://www.nstedb.com/index.html">http://www.nstedb.com/index.html</a>   |
| 16     | NSTEDB – Training   | <a href="http://www.nstedb.com/training/training.html">http://www.nstedb.com/training/training.html</a>   |
| 17     | Tata Exposures  | <a href="http://www.tatasocial-in.com/project-exposure">http://www.tatasocial-in.com/project-exposure</a>   |
| 18     | Ministry of Micro, Small and Medium Enterprises   | <a href="http://www.dcmsme.gov.in/schemes/TEQUPDetail.html">http://www.dcmsme.gov.in/schemes/TEQUPDetail.html</a>   |
| 19     | List of Business Ideas for Small Scale Industry   | <a href="http://small.sidbi.in%20/thinking-starting-business/big-list-business-ideas-small-business">http://small.sidbi.in%20/thinking-starting-business/big-list-business-ideas-small-business</a>   |



|    |  |   |
|----|--|---|
| 20 | Thinking of Entrepreneurship             | <a href="http://smallb.sidbi.in/entrepreneurship-stage/thinking-entrepreneurship">http://smallb.sidbi.in/entrepreneurship-stage/thinking-entrepreneurship</a>         |
| 21 | List of Service for Small Scale Industry | <a href="http://www.archive.india.gov.in/business/Industry_services/illustrative.php">http://www.archive.india.gov.in/business/Industry_services/illustrative.php</a> |
| 22 | NSIC Schemes and Services                | <a href="http://www.nsic.co.in/SCHSERV.ASP">http://www.nsic.co.in/SCHSERV.ASP</a>   |

\* \* \*

**Course Name : Internship-I (4 weeks)**

**Course Code : CCG502**

**Course Abbreviation : GINO**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : Nil**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | --           | 03      |
| Practical        | --           |         |

**Evaluation Scheme :**

| Component | Progressive Assessment                |                            | Semester end        |                         | Total |
|-----------|---------------------------------------|----------------------------|---------------------|-------------------------|-------|
|           | Theory                                | Practical                  | Theory              | Practical**             |       |
| Duration  | Average of two tests of 20 marks each | One Skill Test (2 hours) * | One paper (3 hours) | One practical (2 hours) |       |
| Marks     | ---                                   | --                         | ---                 | 50 E                    | 50    |

\*\* Assessment as per scheme given in Table-3 and Table -4 and convert these marks as per Proforma-I ,E- External Examination

## 1. RATIONALE

This Industrial training (internship) is compulsorily introduced for all the diploma programmes to expose the students for a longer period to the industrial environment and develop the relevant good habits of industry culture among the students before they enter the industry. By exposing and interacting with the real life industrial setting, the students will appreciate and get accustomed to the actual working of an industry along with the best practices adopted by them. The industrial culture skills fall under soft skills, life skills and hands-on which will be inculcated among the students. Such a short exposure will be an effective association with the industry, for the students and will be instrumental in orienting them to be industry ready, to a much greater extent than the present ones, after completion of the respective diploma programme.

## 2. COMPETENCY

The course is intended to develop the following competencies:

- Soft Skills such as: Communication, Presentation etc.
- Life skills such as: Time management, Safety, Innovation, Entrepreneurship, Team building etc.
- Hands-on skills such as: Design, Implementation, Different operations, Quality Assurance etc.

## 3. COURSE OUTCOMES

The industrial training (internship) related competencies as mentioned above to supplement those attained through several courses up to fourth semester of the relevant programme can be achieved by the following course outcomes:

CCG502-1: Communicate effectively (verbal and equally written) the works carried out.

CCG502-2: Prepare and present the report of the works carried out.

CCG502-3: Exercise time management and safety in the work environment.

CCG502-4: Work effectively as a team member.

CCG502-5: Demonstrate various quality assurance skills.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX** [ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos   | Programme Outcomes POs and PSOs                 |                          |  |  |   |                            |                            |                              |  |
|--|---|--------------------------|--|--|---|----------------------------|----------------------------|------------------------------|--|
|  | PO 1<br>Basic and Discipline Specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solution | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>The engineering Practices for society, Sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1<br>Operate and Maintain | PSO2<br>Supervision and Providing Solution |
| <b>Competency: Soft Skills</b> <ul style="list-style-type: none"> <li>• Life skills.</li> <li>• Hands-on skills</li> </ul> | 2   | 2                        | 3  | 2  | 2   | 2                          | 3                          | 3                            | 3  |
| CCG502-1: Communicate effectively (verbal and equally written) the works carried out.                                      | 2   | -                        | -  | -  | -   | -                          | 2                          | -                            | -  |
| CCG502-2: Prepare and present the report of the works carried out.   | -   | 1                        | 3  | 2  | -   | -                          | 2                          | -                            | -  |
| CCG502-3: Exercise time management and safety in the work environment.   | -   | -                        | 2  | -  | -   | -                          | 2                          | 3                            | 3  |
| CCG502-4: Work effectively as a team member.   | -   | -                        | -  | -  | -   | 2                          | 2                          | 3                            | 3  |
| CCG502-5: Demonstrate various quality assurance skills.  | -   | -                        | 3  | -  | -   | -                          | 2                          | -                            | -  |

**Note:** Both ESE and PA part of assessment will be carried out by institute faculty and industry training supervisor as explained in the relevant proforma of assessment.

#### 4. GENERAL GUIDELINES FOR INDUSTRIAL TRAINING

- a) **Training during the programme:** Between 4<sup>th</sup> and 5<sup>th</sup> semester (During Summer Vacation).
- b) **Duration of the training:** four/three weeks
- c) **Training Area:** Students should be trained in large and medium scale Industry / Organization. However, despite the best efforts by the institute, if large and medium scale Industry / Organization are not available to all students then, students can also be placed in small scale Industry / Organization.
- d) These Industries / Organizations can be Government /Public limited/ or Private family enterprises.

| Sr no | Name of project   | Duration |
|-------|---|----------|
| 1     | Study about Building Construction Projects  | 2 Weeks  |
| 2     | Study about projects regarding Transportation Engg<br>(Any one)<br>i)Road works<br>ii)Railway track construction & maintenance<br>iii)Bridges | 2 Weeks  |

Note –1) It is expected that the student will observe all major items related to the building construction by visiting different Building Construction Projects.

- 2) Similarly, in case of roads it is expected that the student will observe items related to WBM & items related to asphaltting works/concrete works. If it is not possible to observe all the items related to road works student may visit & study railway station, yards to study features of railway line or Bridge Construction works.

#### 5. ROLE OF PARENT DEPARTMENT OF THE INSTITUTES

| Sr. No | Activity   | Schedule  |
|--------|--|---|
| 1      | Collecting information about Industry / Organization available for training along with capacity (Format - 1)             | Before completion of 3 <sup>rd</sup> semester               |
| 2      | Student and mentor allocation as per the slots available for in-plant training (Desirable mentor- student ratio is 1:15) | Before commencement of 4 <sup>th</sup> semester             |
| 3      | Communication with Industry / Organization available for training along with capacity and its confirmation               | Before first Unit Test of the 4 <sup>th</sup> semester      |
| 4      | Obtaining consent letter from parents / guardian (Format - 2)  | Before second Unit Test of the 4 <sup>th</sup> semester     |
| 5      | Student enrollment for In-plant training (Format-3)  | Before commencement of 4 <sup>th</sup> semester examination |
| 6      | Issue letter to the Industry / Organization for the training   | During 4 <sup>th</sup> semester examination                 |

|   |   |                                     |
|---|---|-------------------------------------|
|   | along with details of students and mentors. (Format - 4)  |                                     |
| 7 | Mentors to carry out progressive assessment of the students during the in-plant training (Format -5)            | Each week of training               |
| 8 | End of training assessment by mentor along with Industry / Organization expert as external examiner(Format - 6) | Before 5 <sup>th</sup> semester ESE |

**Suggestions:**

- a) Departments can take help of alumni or present students (if they or their parents or relatives have some contact in different industries) for securing placement.
- b) The students would normally be placed as per their choices, in case of more demand for a particular Industry / Organization students would be allocated place based on their relative merit. However, if some students have arranged training placement in some companies with the help of their parents/relatives etc. then they will be given preference for placement in those companies.
- c) Principal/HOD/Faculty should address students about industrial safety norms, rules and discipline to be maintained in the Industry / Organization during the training before relieving students for training.
- d) The faculty member during the visit to Industry / Organization will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.

**6. EXPECTATIONS FROM INDUSTRY**

Helping the institute in developing the following competencies among students

- **Soft Skills such as:** Communication, Presentation etc.
- **Life skills such as:** Time management, Safety, Innovation, Entrepreneurship, Team building etc.
- **Hands-on skills such as:** Design, Implementation, Different operations, Quality Assurance etc.

**7. ROLES AND RESPONSIBILITIES OF THE STUDENTS**

Following should be informed to students in the letter deputing them for the training, an undertaking for this should also be taken from them

- a) Students would interact with the mentor to suggest choices for suitable Industry / Organization. If students have any contact in Industry / Organization (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
- b) Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the industry on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
- c) He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Industry / Organization and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- d) Students should know that if they break any rule of industry or do not follow the discipline then industry can terminate the training and sent back the students.

- e) It is the responsibility of the student to collect information from Industry / Organization about manufacturing processes / testing and quality assurance methods/specifications of machines and raw materials/maintenance procedures/ production planning/organizational structure etc.
- f) During the training period students have to keep record of all the useful information in Log book and maintain the weekly diary as provided and get it signed from mentor as well as Industry / Organization training in-charge.
- g) In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- h) Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Industry / Organization training in-charge.

## **8. FORMAT FOR TRAINING REPORT**

Following is the suggestive format for the training report, actual format may differ slightly depending upon the nature of Industry / Organization. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1. Organizational structure of Industry / Organization and General Lay Out

Chapter 2. Introduction of Industry / Organization (Type of products and services, history, turn over and number of employees etc.)

Chapter 3. Types of major equipment/instruments/ machines used in industry with their specification, approximate cost and specific use and their routine maintenance.

Chapter 4. Manufacturing Processes along with production planning and control methods.

Chapter 5. Testing of raw materials, components and finished products along with quality assurance procedures.

Chapter 6. Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.

Chapter 7. Safety procedures followed and safety gear used (includes Preventive maintenance schedule and breakdown maintenance procedures).

Chapter 8. Particulars of Practical Experiences in Industry / Organization if any in Production/ Assembly/ Testing/Maintenance.

Chapter 9. Short report/description of the project (if any done during the training)

Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

## References /Bibliography

### 9. SUGGESTED LEARNING STRATEGIES

Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc. They should also refer the handbooks of the major machines and operation, testing, quality control and testing manuals used in the industry. Students may also visit websites related to other industries wherein similar products are being manufactured as their learning resource.

### 10. TENTATIVE WEEK-WISE SCHEDULE OF INDUSTRIAL TRAINING

The industrial training is a common course to all programmes; therefore the industry / Organization selection will depend upon the nature of programme and its related industry. The training activity may vary according to nature and size of Industry / Organization. The following table details suggestive schedule for industrial training for all programmes.

**Table - 2 Detail Marks distribution**

| S. No.   | Details of activities to be completed during Industrial training  | Marks distribution/ week for PA |
|--|---|---------------------------------|
| 1  | Induction to industry and its departments   | 05                              |
|  | Study of layout and specifications of major machines, equipment and raw materials / components / software used. | 05                              |
| 2  | Study of setup, processes/ milestone projects.  | 05                              |
|  | Study of QA/QC procedures.  | 10                              |
|  | Study safety and maintenance procedure in an industry/organization  |                                 |
| 3  | Build a project as per requirements from Industry   | 10                              |
| 4  | Report Submission and Completion certificate  | 05                              |
| PA marks to be given by industry supervisor                      |   | 25                              |
| PA marks to be given by polytechnic faculty based on performance |   | 10                              |
| <b>Total PA marks for training</b>                               |   | <b>75</b>                       |

**Table - 3 ASSESSMENT SCHEME FOR INDUSTRIAL TRAINING**

| Training duration | PROGRESSIVE ASSESSMENT<br>(Weekly report of all 4week and attendance) |            | END SEMESTER ASSESSMENT<br>(Seminar and Oral ) |            | Total marks |            |
|-------------------|---|------------|--|------------|-------------|------------|
|                   | Max. marks  | Min. marks | Max. marks                                     | Min. marks | Max. marks  | Min. marks |
| Six weeks         | #75   | -----      | 75**   | 30         | 150         | 60         |

\*\*assessed by external examiner based on report (25 Marks), presentation (25 Marks) and Viva-Voce (25 Marks)

**Table - 4 Distribution of End-Semester-Examination (ESE) marks of Industrial Training for Internal and External Examiners**

| Marks for Industrial Training Report | Marks for Seminar/Presentation | Marks for Oral/Viva-voce | Total ESE marks |
|--------------------------------------|--------------------------------|--------------------------|-----------------|
| 25                                   | 25                             | 25                       | 75              |



**Format-1 : Information about Industry/Organization for training**

- 1) Name of the industry/organization:
- 2) Address/communication details(incl email):
- 3) Contact person details:
  - a) Name:
  - b) Designation:
  - c) Email
  - d) Contact number/s:
- 4) Type:  
Govt / PSU / Pvt /  
Large scale / Medium scale / Small scale .....
- 5) Products/services offered by industry:
- 6) a) Whether willing to offer Industrial training facility during May/ June for Diploma in Engineering students: Yes / No.  
b) If yes, whether you offer 6 weeks training : YES/NO  
c) Internship capacity possible:

| Programme | Civil Engg | Mechanical Engg | Electrical Engg | ..... | Total |
|-----------|------------|-----------------|-----------------|-------|-------|
| Male      |            |                 |                 |       |       |
| Female    |            |                 |                 |       |       |
| Total     |            |                 |                 |       |       |

- 7) Whether accommodation available for interns Yes / No.  
If yes capacity: \_\_\_\_\_
- 8) Whether internship is charged or free:  
If charged please specify amount per candidate: \_\_\_\_\_

Signature of responsible person:

---

**Format-2 : Obtaining Consent Letter from parents/guardians**

**(Undertaking from Parents)**

To,  
The Principal,

\_\_\_\_\_ ,

**Subject: Consent for Industrial Training.**

Sir/Madam,

I am fully aware that -

- i) My ward studying in \_\_\_\_\_ semester at your \_\_\_\_\_ institute has to undergo six weeks of Industrial training for partial fulfillment towards completion of Diploma in \_\_\_\_\_ Engineering.
- ii) For this fulfillment he/she has been deputed at \_\_\_\_\_ industry, located at \_\_\_\_\_ for internship of \_\_\_\_\_ weeks for the period from \_\_\_\_\_ to \_\_\_\_\_ .

With respect to above I give my full consent for my ward to travel to and from the mentioned industry. Further I undertake that –

- a) My ward will undergo the training at his/her own cost and risk during training and/or stay.
- b) My ward will be entirely under the discipline of the organization where he/she will be placed and will abide by the rules and regulations in face of the said organization.
- c) My ward is NOT entitled to any leave during training period.
- d) My ward will submit regularly a prescribed weekly diary ,duly filled and countersigned by the training supervisor of the organization to the mentor faculty of the polytechnic.

I have explained the contents of the letter to my ward who has also promised to adhere strictly to the requirements. I assure that my ward will be properly instructed to take his own care to avoid any accidents/injuries in the industry. In case of any accident neither industry nor the institute will be held responsible.

Signature :

Name : \_\_\_\_\_

Address : \_\_\_\_\_

Phone Number: \_\_\_\_\_

**Format-3 : Student enrollment for In-plant training (To be design by programme department)**

| <b>Sr. no.</b> | <b>Enrolment no.</b> | <b>Name,email id,Contact no.</b> | <b>Mentor, email id,Contact no.</b> | <b>Name of Industry,Address, email id,Contact no.</b> |
|----------------|----------------------|----------------------------------|-------------------------------------|---|
|                |                      |                                  |                                     |   |
|                |                      |                                  |                                     |   |
|                |                      |                                  |                                     |   |

**Format-4: Issue Letter to the Industry/Organisation for the training alongwith details of students and mentors**

To,  
The HR Manager,

\_\_\_\_\_

Subject: Placement for Industrial training of \_\_\_ weeks in your organization....

Reference: Your consent letter no: ....

Sir,

With reference to the above we are honored to place the following students from this institute for Industrial training in your esteemed organization as per the arrangement arrived at.

Diploma programme in \_\_\_\_\_ Engg.

| Sr. no. | Enrolment no. | Name: | Mentor |
|---------|---------------|-------|--------|
|         |               |       |        |
|         |               |       |        |
|         |               |       |        |

Diploma programme in \_\_\_\_\_ Engg.

| Sr. no. | Enrolment no. | Name: | Mentor |
|---------|---------------|-------|--------|
|         |               |       |        |
|         |               |       |        |
|         |               |       |        |

Kindly do the needful and oblige.  
Thanking you in anticipation

Yours sincerely,

(Principal)

Name of the Institute:  
with Seal

**FORMAT-5**  
**PA of Internship-I**

Academic year : 20 -20

Name of the industry:

| Sr. No | Enrolment Number | Name of student | Marks             |                   |                   |                  |                       | PA Marks by Industry Supervisor | PA based on Report by mentor faculty | Total                 |
|--------|------------------|-----------------|-------------------|-------------------|-------------------|------------------|-----------------------|---------------------------------|--------------------------------------|-----------------------|
|        |                  |                 | Week 1(Out of 10) | Week 2(Out of 15) | Week 3(out of 10) | Week 4(Out of 5) | Total (A)(out of 40 ) | Out of 25 (B)                   | Out of 10 (C)                        | Out of 75 (A)+(B)+(C) |
|        |                  |                 |                   |                   |                   |                  |                       |                                 |                                      |                       |
|        |                  |                 |                   |                   |                   |                  |                       |                                 |                                      |                       |
|        |                  |                 |                   |                   |                   |                  |                       |                                 |                                      |                       |

Marks for PA are to be awarded for each week considering the level of completeness of activity observed, from the daily diary maintained and feedback from industry supervisor.

Name of mentor:

Signature of mentor

**Format-6: End of training assessment by mentor along with Industry/Organization expert as external examiner (To be design by programme department)**

| <b>Marks for Industrial Training Report</b> | <b>Marks for Seminar/Presentation</b> | <b>Marks for Oral/Viva-voce</b> | <b>Total ESE marks</b> |
|---|---------------------------------------|---------------------------------|------------------------|
| 25  | 25                                    | 25                              | 75                     |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |

\*\* Assessment as per scheme given in Table-3 and Table -4 and convert these marks to 50 as per Proforma-I E– External Examination

**Course Name** : **Internship-II (3 weeks)**  
**Course Code** : **CCG503**  
**Course Abbreviation** : **GINT**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : **Nil**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | --           | 02      |
| Practical        | --           |         |

**Evaluation Scheme:**

| Component | Progressive Assessment                |                            | Semester end        |                         | Total |
|-----------|---------------------------------------|----------------------------|---------------------|-------------------------|-------|
|           | Theory                                | Practical                  | Theory              | Practical*              |       |
| Duration  | Average of two tests of 20 marks each | One Skill Test (2 hours) * | One paper (3 hours) | One practical (2 hours) |       |
| Marks     | ---                                   | --                         | ---                 | 50 E                    | 50    |

\* Assessment as per scheme given in Table-3 and Table -4, E– External Examination

**1. RATIONALE**

This Industrial training (internship) is compulsorily introduced for all the diploma programme to expose the students for a longer period to the industrial environment and develop the relevant good habits of industry culture among the students before they enter the industry. By exposing and interacting with the real life industrial setting, the students will appreciate and get accustomed to the actual working of an industry along with the best practices adopted by them. The industrial culture skills fall under soft skills, life skills and hands-on which will be inculcated among the students. Such a short exposure will be an effective association with the industry, for the students and will be instrumental in orienting them to be industry ready, to a much greater extent than the present ones, after completion of the respective diploma programme.

**2. COMPETENCY**

The course is intended to develop the following competencies:

- Soft Skills such as: Communication, Presentation etc.
- Life skills such as: Time management, Safety, Innovation, Entrepreneurship, Team building etc.
- Hands-on skills such as: Design, Implementation, Different operations, Quality Assurance etc.

### 13 COURSE OUTCOMES

The industrial training (internship) related competencies as mentioned above to supplement those attained through several courses up to fourth semester of the relevant programme can be achieved by the following course outcomes:

**CCG503-1:** Communicate effectively (verbal and equally written) the works carried out.

**CCG503-2:** Prepare and present the report of the works carried out.

**CCG503-3:** Exercise time management and safety in the work environment.

**CCG503-4:** Work effectively as a team member.

**CCG502-5:** Demonstrate various quality assurance skills.

**Note:** Both ESE and PA part of assessment will be carried out by institute faculty and industry training supervisor as explained in the relevant proforma of assessment.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX** [ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Competency and Cos   | Programme Outcomes POs and PSOs                 |                          |  |  |   |                            |                            |                              |  |
|--|---|--------------------------|--|--|---|----------------------------|----------------------------|------------------------------|--|
|  | PO 1<br>Basic and Discipline Specific knowledge | PO 2<br>Problem Analysis | PO 3<br>Design / Development of solution | PO 4<br>Engineering Tools, Experimentation and Testing | PO 5<br>The engineering Practices for society, Sustainability and environment | PO 6<br>Project Management | PO 7<br>Life-long Learning | PSO1<br>Operate and Maintain | PSO2<br>Supervision and Providing Solution |
| <ul style="list-style-type: none"> <li>Competency: Soft Skills</li> <li>Life skills.</li> <li>Hands-on skills</li> </ul> | 2   | 2                        | 3  | 2  | 2   | 2                          | 3                          | 3                            | 3  |
| CCG502-1: Communicate effectively (verbal and equally written) the works carried out.                                    | 2   | -                        | -  | -  | -   | -                          | 2                          | -                            | -  |
| CCG502-2: Prepare and present the report of the works carried out.   | -   | 1                        | 3  | 2  | -   | -                          | 2                          | -                            | -  |
| CCG502-3: Exercise time management and safety in the work environment.   | -   | -                        | 2  | -  | -   | -                          | 2                          | 3                            | 3  |
| CCG502-4: Work effectively as a team member.   | -   | -                        | -  | -  | -   | 2                          | 2                          | 3                            | 3  |
| CCG502-5: Demonstrate various quality assurance skills.  | -   | -                        | 3  | -  | -   | -                          | 2                          | -                            | -  |



### 3. GENERAL GUIDELINES FOR INDUSTRIAL TRAINING

- a) **Training during the programme:** After 5<sup>th</sup> semester (During Winter Vacation).
- b) **Duration of the training:** Three weeks
- c) **Training Area:** Students should be trained in large and medium scale Industry / Organization. However, despite the best efforts by the institute, if large and medium scale Industry / Organization are not available to all students then, students can also be placed in small scale Industry / Organization.
- d) These Industries / Organizations can be Government /Public limited/ or Private family enterprises.

| Sr no | Name of project  | Remark |
|-------|--|--------|
| 1     | Study about Irrigation Engg Projects   |        |
| 2     | Study about Environment Engg projects  |        |
| 3     | Visit to Executive Engg office of PWD/ Irrigation department/ MJP ( any one) |        |

**Note –1)** It is compulsory to observe all above three types of projects.

- 3) It is expected that the student will observe all major items related to the Irrigation Engineering Projects and Environmental Engineering Projects.

### 4. ROLE OF PARENT DEPARTMENT OF THE INSTITUTES

| Sr. No | Activity   | Schedule  |
|--------|--|---|
| 1      | Collecting information about Industry / Organization available for training along with capacity (Format - 1)             | Before completion of 4 <sup>th</sup> semester               |
| 2      | Student and mentor allocation as per the slots available for in-plant training (Desirable mentor- student ratio is 1:15) | Before commencement of 5 <sup>th</sup> semester             |
| 3      | Communication with Industry / Organization available for training along with capacity and its confirmation               | Before first Unit Test of the 5 <sup>th</sup> semester      |
| 4      | Obtaining consent letter from parents / guardian (Format - 2)  | Before second Unit Test of the 5 <sup>th</sup> semester     |
| 5      | Student enrollment for In-plant training (Format- 3)   | Before commencement of 5 <sup>th</sup> semester examination |
| 6      | Issue letter to the Industry / Organization for the training along with details of students and mentors. (Format - 4)    | During 5 <sup>th</sup> semester examination                 |
| 7      | Mentors to carry out progressive assessment of the students during the in-plant training (Format - 5)                    | Each week of training                                       |
| 8      | End of training assessment by mentor along with Industry / Organization expert as external examiner(Format - 6)          | After 5 <sup>th</sup> semester ESE                          |

**Suggestions:**

- a) Departments can take help of alumni or present students (if they or their parents or relatives have some contact in different industries) for securing placement.
- b) The students would normally be placed as per their choices, in case of more demand for a particular Industry / Organization students would be allocated place based on their relative merit. However, if some students have arranged training placement in some companies with the help of their parents/relatives etc. then they will be given preference for placement in those companies.
- c) Principal/HOD/Faculty should address students about industrial safety norms, rules and discipline to be maintained in the Industry / Organization during the training before relieving students for training.
- d) The faculty member during the visit to Industry / Organization will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.

**5. EXPECTATIONS FROM INDUSTRY**

Helping the institute in developing the following competencies among students

- **Soft Skills such as: Communication, Presentation etc.**
- **Life skills such as: Time management, Safety, Innovation, Entrepreneurship, Team building etc.**
- **Hands-on skills such as: Design, Implementation, Different operations, Quality Assurance etc.**

**6. ROLES AND RESPONSIBILITIES OF THE STUDENTS**

Following should be informed to students in the letter deputing them for the training, an undertaking for this should also be taken from them

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## **7. FORMAT FOR TRAINING REPORT**

Following is the suggestive format for the training report, actual format may differ slightly depending upon the nature of Industry / Organization. The training report may contain the following

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Chapter 3. Types of major equipment/instruments/ machines used in industry with their specification, approximate cost and specific use and their routine maintenance.

Chapter 4. Manufacturing Processes along with production planning and control methods.

Chapter 5. Testing of raw materials, components and finished products along with quality assurance procedures.

Chapter 6. Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.

Chapter 7. Safety procedures followed and safety gear used (includes Preventive maintenance schedule and breakdown maintenance procedures).

Chapter 8. Particulars of Practical Experiences in Industry / Organization if any in Production/ Assembly/ Testing/Maintenance.

Chapter 9. Short report/description of the project (if any done during the training)

Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

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## **8. SUGGESTED LEARNING STRATEGIES**

Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc. They should also refer the handbooks of the major machines and operation, testing, quality control and testing manuals used in the industry. Students may also visit websites related to other industries wherein similar products are being manufactured as their learning resource.

### 9. TENTATIVE WEEK-WISE SCHEDULE OF INDUSTRIAL TRAINING

The industrial training is a common course to all programmes; therefore the industry / Organization selection will depend upon the nature of programme and its related industry. The training activity may vary according to nature and size of Industry / Organization. The following table details suggestive schedule for industrial training for all programmes.

| S. No.   | Week No.   | Details of activities to be completed during Industrial training  | Marks distribution/ week for PA |
|--|------------|---|---------------------------------|
| 1  | Week No. 1 | Induction to industry and its departments   | 05                              |
|  |            | Study of layout and specifications of major machines, equipment and raw materials / components / software used. | 05                              |
|  |            | Study of setup ,processes/ milestone project.   | 05                              |
|  |            | Study of QA/QC procedures.  |                                 |
|  |            | Study safety and maintenance procedure in an industry/organization  |                                 |
| 2  | Week No. 2 | Finalize the project work in consultation with the industry personnel/department .                              | 05                              |
|  |            | Gather the resources/literature etc. necessary for the accomplishment of the project.                           | 05                              |
|  |            | Build the project as per requirements.  | 10                              |
| 3  | Week No. 3 | Report submission and completion certificate  | 05                              |
| PA marks to be given by industry supervisor                      |            |   | 25                              |
| PA marks to be given by polytechnic faculty based on performance |            |   | 10                              |
| <b>Total PA marks for training</b>                               |            |   | <b>75</b>                       |

Table - 3 ASSESSMENT SCHEME FOR INDUSTRIAL TRAINING

| Training duration | PROGRESSIVE ASSESSMENT<br>(Weekly report of all 4week and attendance) |            | END SEMESTER ASSESSMENT<br>(Seminar and Oral ) |            | Total marks |            |
|-------------------|---|------------|--|------------|-------------|------------|
|                   | Max. marks  | Min. marks | Max. marks                                     | Min. marks | Max. marks  | Min. marks |
| Six weeks         | #75   | ----       | 75**   | 30         | 150         | 60         |

\*\*assessed by external examiner based on report (25 Marks), presentation (25 Marks) and Viva-Voce (25 Marks)

**Table - 4 Distribution of End-Semester-Examination (ESE) marks of Industrial Training for Internal and External Examiners**

| <b>Marks for Industrial Training Report</b> | <b>Marks for Seminar/Presentation</b> | <b>Marks for Oral/Viva-voce</b> | <b>Total ESE marks</b> |
|---|---------------------------------------|---------------------------------|------------------------|
| 25  | 25                                    | 25                              | 75                     |

**Format-1 : Information about Industry/Organization for training**

- 9) Name of the industry/organization:  
10) Address/communication details(incl email):  
11) Contact person details:  
    e) Name:  
    f) Designation:  
    g) Email  
    h) Contact number/s:  
  
12) Type:  
    Govt / PSU / Pvt /  
    Large scale / Medium scale / Small scale .....  
13) Products/services offered by industry:  
  
14) a) Whether willing to offer Industrial training facility during May/ June for Diploma in  
    Engineering students: Yes / No.  
    b) If yes, whether you offer 6 weeks training : YES/NO  
    c) Internship capacity possible:

| Programme | Civil Engg | Mechanical Engg | Electrical Engg | ..... | Total |
|-----------|------------|-----------------|-----------------|-------|-------|
| Male      |            |                 |                 |       |       |
| Female    |            |                 |                 |       |       |
| Total     |            |                 |                 |       |       |

- 15) Whether accommodation available for interns Yes / No.  
    If yes capacity: \_\_\_\_\_  
  
16) Whether internship is charged or free:  
    If charged please specify amount per candidate: \_\_\_\_\_

Signature of responsible person:

---

**Format-2 : Obtaining Consent Letter from parents/guardians**

**(Undertaking from Parents)**

To,  
The Principal,

\_\_\_\_\_ ,

**Subject: Consent for Industrial Training.**

Sir/Madam,

I am fully aware that -

- iii) My ward studying in \_\_\_\_\_ semester at your \_\_\_\_\_ institute has to undergo six weeks of Industrial training for partial fulfillment towards completion of Diploma in \_\_\_\_\_ Engineering.
- iv) For this fulfillment he/she has been deputed at \_\_\_\_\_ industry, located at \_\_\_\_\_ for internship of \_\_\_\_\_ weeks for the period from \_\_\_\_\_ to \_\_\_\_\_ .

With respect to above I give my full consent for my ward to travel to and from the mentioned industry. Further I undertake that –

- e) My ward will undergo the training at his/her own cost and risk during training and/or stay.
- f) My ward will be entirely under the discipline of the organization where he/she will be placed and will abide by the rules and regulations in face of the said organization.
- g) My ward is NOT entitled to any leave during training period.
- h) My ward will submit regularly a prescribed weekly diary ,duly filled and countersigned by the training supervisor of the organization to the mentor faculty of the polytechnic.

I have explained the contents of the letter to my ward who has also promised to adhere strictly to the requirements. I assure that my ward will be properly instructed to take his own care to avoid any accidents/injuries in the industry. In case of any accident neither industry nor the institute will be held responsible.

Signature :

Name : \_\_\_\_\_

Address : \_\_\_\_\_

Phone Number: \_\_\_\_\_

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**Format-3 : Student enrollment for In-plant training (To be design by programme department)**

| <b>Sr. no.</b> | <b>Enrolment no.</b> | <b>Name,email id,Contact no.</b> | <b>Mentor, email id,Contact no.</b> | <b>Name of Industry,Address, email id,Contact no.</b> |
|----------------|----------------------|----------------------------------|-------------------------------------|---|
|                |                      |                                  |                                     |   |
|                |                      |                                  |                                     |   |
|                |                      |                                  |                                     |   |



**Format-4: Issue Letter to the Industry/Organization for the training along with details of students and mentors**

To,

The HR Manager,

\_\_\_\_\_

Subject: Placement for Industrial training of \_\_\_ weeks in your organization....

Reference: Your consent letter no: ....

Sir,

With reference to the above we are honored to place the following students from this institute for Industrial training in your esteemed organization as per the arrangement arrived at.

Diploma programme in \_\_\_\_\_ Engg.

| Sr. no. | Enrolment no. | Name: | Mentor |
|---------|---------------|-------|--------|
|         |               |       |        |
|         |               |       |        |
|         |               |       |        |

Diploma programme in \_\_\_\_\_ Engg.

| Sr. no. | Enrolment no. | Name: | Mentor |
|---------|---------------|-------|--------|
|         |               |       |        |
|         |               |       |        |
|         |               |       |        |

Kindly do the needful and oblige.

Thanking you in anticipation

Yours sincerely,

(Principal)

Name of the Institute:  
with Seal

**FORMAT-5**  
**PA of Internship-I**

Academic year : 20 -20

Name of the industry:

| Sr. No. | Enrolment Number | Name of student | Marks             |                   |                   |                       | PA Marks by Industry Supervisor | PA based on Report by mentor faculty | Total                 |
|---------|------------------|-----------------|-------------------|-------------------|-------------------|-----------------------|---------------------------------|--------------------------------------|-----------------------|
|         |                  |                 | Week 1(Out of 15) | Week 2(Out of 20) | Week 3(out of 05) | Total (A)(out of 40 ) | Out of 25 (B)                   | Out of 10 (C)                        | Out of 75 (A)+(B)+(C) |
|         |                  |                 |                   |                   |                   |                       |                                 |                                      |                       |
|         |                  |                 |                   |                   |                   |                       |                                 |                                      |                       |
|         |                  |                 |                   |                   |                   |                       |                                 |                                      |                       |

Marks for PA are to be awarded for each week considering the level of completeness of activity observed, from the daily diary maintained and feedback from industry supervisor.

Name of mentor:

Signature of mentor

**Format-6: End of training assessment by mentor along with Industry/Organization expert as external examiner (To be design by programme department)**

| <b>Marks for Industrial Training Report</b> | <b>Marks for Seminar/Presentation</b> | <b>Marks for Oral/Viva-voce</b> | <b>Total ESE marks</b> |
|---|---------------------------------------|---------------------------------|------------------------|
| 25  | 25                                    | 25                              | 75                     |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |
|   |                                       |                                 |                        |

\*\* Assessment as per scheme given in Table-3 and Table -4 and convert these marks to 50 as per Proforma-I E– External Examination

**COURSE ID :**

**Course Name : CIVIL ENGINEERING PROJECT - I**  
**Course Code : CEG501**  
**Course Abbreviation : GCPI**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : NIL.**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | --           | 02      |
| Practical        | 02           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment |           | Term End Examination |                       |  | Total     |
|-----------------------|------------------------|-----------|----------------------|-----------------------|--|-----------|
|                       | Theory                 | Practical | Theory               | Continuous Assessment | Oral*                                    |           |
| Details of Evaluation | ---                    | ---       | ---                  | As per Proforma       | Based on Project work as per proforma IV |           |
| Marks                 | ---                    | ---       | ---                  | -----                 | 50 I                                     | <b>50</b> |

(To be assessed by internal and external examiner as per proforma IV)

**RATIONALE:**

The subject of Civil Engg Project - I work is included in the curriculum mainly with a view to provide students with an opportunity to develop synthesizing skill and to enable them to integrate knowledge of all core Subjects in producing a total meaningful scheme.

A student is given a real life problem and he has to provide a feasible solution for which he is supposed to collect suitable data through survey and contacting various resources viz. various engineering and non engineering sectors, handbooks and data-books. He will analyse and organize the data and prepare drawings and write a detailed report of every activities he undertook to reach to the solution. Through independent individual as well as group activities a student is made interact with his colleagues and persons in the field, technical profession and justify his own decisions. Ultimately, the project and seminar activity develops capacity in the diploma holders to enter in to the world of today

**COMPETENCY :**

Achieve the technique of collection of data, leadership quality, reading drawings and designing.

**Cognitive:** Applying principles of Engineering of core subjects learnt earlier.

**Psychomotor:** i) Collection of data ii) Forecasting iii) Innovative ideas iv) Designing  
 v) Analysis vi) Problem solving.

**Affective:** Attitude of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation  
 v) Innovative aspect vi) civic sense

**A. COURSE OUTCOMES :**

**CEG501-1** Decide a Project.

**CEG501-2** Collect the data required

**CEG501-3** Collect the norms, IS codes, monograms, charts, graphs.

**CEG501-4** Calculate & design the scheme based on data collected, provide solution for the problem.

**CEG501-5** Determine merits & demerits, Benefit-Cost ratio, eco-friendliness, if any.

**CEG501-6** Present seminar. (Presentation & Communication skills)

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

**The Seminar shall contain**

| Competency and COs   | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|--|--|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b><br>Apply principles of Project-I to solve engineering problems                        | 3  | 3                     | 2                                    | 2   | 1   | 1                       | 1                       | 1                    | 1                                 | 1                             |
| <b>CEG501-1</b> Decide a Project.  | 3  | 3                     | 2                                    | 2   | 2   | 3                       | 1                       | 2                    | 2                                 | 2                             |
| <b>CEG501-2</b> Collect the data required  | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 2                                 | 2                             |
| <b>CEG501-3</b> Collect the norms, IS codes, monograms, charts, graphs.                                  | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 2                                 | 3                             |
| <b>CEG501-4</b> Calculate & design the scheme based on data collected, provide solution for the problem. | 3  | 3                     | 2                                    | 2   | 3   | 2                       | 1                       | 2                    | 2                                 | 3                             |
| <b>CEG501-5</b> Determine merits & demerits, Benefit-Cost ratio, eco-friendliness, if any.               | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 3                             |
| <b>CEG501-6</b> Present seminar. (Presentation & Communication skills)                                   | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 2                                 | 3                             |

**I. Project Report :**

- 1.1 Title of the Project
- 1.2 Names of the students
- 1.3 The report shall be based on the above preliminary investigations
- 1.4 Problem Identification
- 1.5 Selection of proper methodology/solution.
- 1.6 Resources required.
- 1.7 Conclusion & further Scope
- 1.8 Bibliography & References.

**In-plant training:**

II In-plant training report. (The number of students per batch shall be 5 To 6 )

**A List of Projects:**

The students should submit **ANY ONE** of the following projects with complete details covering the above cited Preliminary investigations and seminar

1. Minor Irrigation Project.
2. Percolation tank.
3. Lift Irrigation.
4. Drip Irrigation.
5. K.T. Weir
6. Rain Water harvesting for domestic and public building.
7. Green House.
8. Water Shed Development of small catchment.
9. Planning and Design of Water treatment plant for given data.
10. Water Supply scheme for a small town or village.
11. Sewerage system for a town or city.
12. Water distribution system for a town/a big colony/a big size public building
13. Industrial waste treatment of an Industry.
14. Solid Waste management.
15. Hospital Waste disposal.
16. Recycling of resources.
17. Highway Construction project including design of a cross drainage work.
18. Permanent way construction of Railway including a tunnel with detailed drawing & Design.
19. Bridge Design.
20. Earthquake resistant building construction.
21. Earthquake resistant design of Engineered and Non engineered structures.
22. Retrofitting of Structures.
23. Advance Repair Techniques.
24. Advance Construction Techniques.
25. Low cost housing.
26. Ferro cement Units.
27. Manufacturing of Precast Concrete Products
28. Town planning.
29. Junction Planning for City roads / Planning for Roads for congested area / Parking Studies.
30. House Keeping in Building Construction.

31. Village Sanitation and Health.
32. NDT of any RCC building
33. Non-conventional sources of energy
34. Interior design and decoration.
35. Thermal efficient construction : Green building,etc
36. Flood resistant buildings
37. Disaster Management
38. Permanent Way Construction
39. Tunnels /Docks/Runways/International standard Swimming Pool Construction
40. Any current topic related to Civil Engineering.

### CONTINUOUS ASSESSMENT

#### Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

| Sr. no | Criteria                           | Marks allotted |
|--------|------------------------------------|----------------|
| 1      | Attendance at regular practical    | 02             |
| 2      | Collection of data                 | 03             |
| 3      | Planning and finalizing of project | 05             |
| 4      | Participation /Team work.          | 05             |
| 5      | Presentation of Seminar.           | 10             |
|        | <b>Total</b>                       | <b>25</b>      |

### INDUSTRIAL EXPOSURE:

| SN | Mode of Exposure                                  | Topic  |
|----|---|--|
| 1. | Field Visits concerned to project work            | All concerned subjects including allied subjects |
| 2  | In-plant training in any industry or organization | All concerned subjects including allied subjects |

### INSTRUCTIONAL STRATEGIES:

#### Instructional Methods:

1. Lectures cum Demonstrations / Discussions
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

#### Teaching and Learning resources:

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank
5. Searching Websites.

**COURSE ID:**

**Course Name** : CIVIL ENGINEERING PROJECT II  
**Course Code** : CEG502  
**Course Abbreviation** : GCP2

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : GCPI- CEG501

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | --           | 04      |
| Practical        | 04           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment |           | Term End Examination |                       |                                       | Total      |
|-----------------------|------------------------|-----------|----------------------|-----------------------|---------------------------------------|------------|
|                       | Theory                 | Practical | Theory               | Continuous Assessment | Oral                                  |            |
| Details of Evaluation | ---                    | ---       | ---                  | As per Proforma III   | Based on Project work as per proforma |            |
| Marks                 | ---                    | ---       | ---                  | ---                   | 100 E**                               | <b>100</b> |

\*\* (To be assessed by internal and external examiner as per proforma III.)

**RATIONALE:**

As a part of supervising the construction of Civil Engg. Works, a diploma technician has to survey, collect data, refer handbooks, search websites and design some components on the basis of his knowledge of different subjects like Applied Mechanics, Concrete Technology, Soil Mechanics, Hydraulics, Construction, Irrigation and Environmental Engineering etc.

The subject of project work is included in the syllabus mainly with a view to provide students with an opportunity to develop synthesizing skill and to enable them to integrate knowledge of Subjects in producing a total meaningful scheme.

A student is given a real life problem and he has to provide a feasible solution for which he is supposed to collect suitable data through survey and contacting various resources through handbooks and data-books, websites, design suitable components, prepare drawings and write a detailed report of activities he undertook to reach to the solution. Through independent individual as well as group activities a student is made to interact with his colleagues and persons in the field, technical professionals and justify his own decisions. The project and seminar activity develops ability & confidence in diploma holders to enter in to the world of today & perform as per the requirements of the construction field.



**COMPETENCY:** Achieve the technique of collection of data, analyse the data, leadership quality, reading drawings and designing.

**Cognitive:** Applying principles of Engineering of core subjects learnt earlier.

**Psychomotor:** i) Collection of data ii) Analysis iii) Innovative ideas iv) Designing v) solve the identified problem

**Affective:** Attitude of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation  
v) Innovative aspect vi) civic sense

**COURSE OUTCOMES:**

**CEG502-1 Decide** a particular project among the various alternatives, studied under CEG 501

**CEG502-2** Collect various data related to selected project

**CEG502-3** Correlate & handle the collected data in sequence

**CEG502-4** Design the scheme using norms, IS codes, nomograms, charts, graphs, if any

**CEG502-5** Establish the project theme / new idea towards the expected scheme after going through its Merits and de-merits, BC ratio, eco-friendliness, if any

**CEG502-6** Present seminar. (Presentation & Communication skills)

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation]

| Competency and COs   | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
|--|--|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| <b>Competency:</b> Apply principles of Project-2 to solve engineering problems                   | 3  | 3                     | 2                                    | 2   | 1   | 1                       | 1                       | 1                    | 1                                 | 2                             |
| <b>CEG502-1</b> Decide a particular project among the various alternatives, studied under CEG501 | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 2                             |
| <b>CEG502-2</b> Collect various data related to selected project                                 | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 1                             |
| <b>CEG502-3</b> Correlate & handle the collected data in sequence                                | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 3                             |
| <b>CEG502-4</b> Design the scheme using norms, IS codes, nomograms, charts, graphs, if any       | 3  | 3                     | 2                                    | 2   | 3   | 2                       | 1                       | 2                    | 1                                 | 3                             |
| <b>CEG502-5</b> Establish the project theme  | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 1                                 | 3                             |
| <b>CEG502-6</b> Present seminar. (Presentation & Communication skills)                           | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 1                       | 2                    | 2                                 | 3                             |

**1. The project report shall contain :**

- 1.1 Title of the Project
- 1.2 Names of the Students
- 1.3 Certificate
- 1.4 Acknowledgement
- 1.5 Index
- 1.6 Synopsis
- 1.7 Chapters
  - i. Introduction
  - ii. Concepts & principles :
  - iii. Survey & investigations
  - iv. Planning concepts
  - v. design & drawing.
  - vi. Case study: Information regarding data required for planning, designing & construction, drawings,etc must be included
  - vii. Conclusion & further Scope
  - viii. Bibliography & References

The report should contain diagrams, charts, Photographs etc relevant for the project.

**2. List of Projects :**

The students should submit **ANY ONE** of the following projects with complete details viz. collection of data , Survey work, Management and construction procedure, Resource scheduling, design & drawing, Conclusion, etc.

1. Minor Irrigation Project.
2. Percolation tank.
3. Lift Irrigation.
4. Drip Irrigation.
5. K.T. Weir
6. Rain Water harvesting for domestic and public building.
7. Green House.
8. Water Shed Development of small catchment.
9. Planning and Design of Water treatment plant for given data.
10. Water Supply scheme for a small town or village.
11. Sewerage system for a town or city.
12. Water distribution system for a town/a big colony/a big size public building
13. Industrial waste treatment of an Industry.
14. Solid Waste management.
15. Hospital Waste disposal.
16. Recycling of resources.
17. Highway Construction project including design of a cross drainage work.
18. Permanent way construction of Railway including a tunnel with detailed drawing & Design.
19. Bridge Design.
20. Earthquake resistant building construction.
21. Earthquake resistant design of Engineered and Non engineered structures.
22. Retrofitting of Structures.
23. Advance Repair Techniques.
24. Advance Construction Techniques.
25. Low cost housing.
26. Ferro cement Units.

27. Manufacturing of Precast Concrete Products
28. Town planning.
29. Junction Planning for City roads / Planning for Roads for congested area / Parking Studies.
30. House Keeping in Building Construction.
31. Village Sanitation and Health.
32. NDT of any RCC building
33. Non-conventional sources of energy
34. Interior design and decoration.
35. Thermal efficient construction : Green building,etc
36. Flood resistant buildings
37. Disaster Management
38. Permanent Way Construction
39. Tunnels /Docks/Runways/International standard Swimming Pool Construction
40. Any current topic related to Civil Engineering.

**The number of students per batch shall be 5 To 6**

**A) CONTINUOUS ASSESSMENT**

**Criteria for Continuous Assessment of Practical work and Progressive Skill Test:**

| Sr. no | Criteria                                     | Marks allotted |
|--------|--|----------------|
| 1      | Attendance at regular practical              | 05             |
| 2      | Collection of data                           | 05             |
| 3      | Planning /design of project                  | 10             |
| 4      | Participation /Team work.                    | 10             |
| 5      | Preparation of Plans/drawing/charts/ Graphs. | 10             |
| 6      | Report writing /preparation/Seminar          | 10             |
|        | <b>Total</b>                                 | <b>50</b>      |

**B) Oral based on project report & seminar as per Proforma III by Both Internal & External Examiners.**

**INDUSTRIAL EXPOSURE:**

| SN | Mode of Exposure                       | Topic  |
|----|--|--|
| 1. | Field Visits concerned to project work | All concerned subjects including allied subjects |

**Criteria of marks for Oral based on Project Report/Presentation.**

| Sr. no | Criteria                                       | Marks allotted |
|--------|--|----------------|
| 1      | Selection of project. & Attendance.            | 05             |
| 2      | Collection of data                             | 05             |
| 3      | Planning /visits to the site/design of project | 10             |
| 4      | Analysis of data./ calculations.               | 10             |
| 5      | Documentation/drawings/charts/ Graphs.         | 10             |
| 6      | Report writing /Presentation/Seminar           | 10             |
|        | <b>Total</b>                                   | <b>50</b>      |

## **INSTRUCTIONAL STRATEGIES:**

### **Instructional Methods:**

1. Lectures cum Demonstrations / Discussions
2. Classroom practices
3. Site Visits
4. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
5. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

### **Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank
5. searching web sites of related project.

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**GOVERNMENT POLYTECHNIC, KOLHAPUR**

(An Autonomous Institute of Government of Maharashtra)

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**Performa P-1**

**PROJECT SHEET**

(For each project)

**Programme :**

**Title of Project :**

**Rationale of Project :**

**Type of project :** (Product making / research / problem solving / industry based / etc.)

**Uniqueness of project :**

**Inter-disciplinary component of project :**

**Process of Identification and Finalization of Topic of Project :**

(Review of previous projects / Brain storming session for project ideas / Internet search for topic / Industry or field problem search, etc.)

**Project Outcomes (PROs)**

- 1.
- 2.
- 3.
- 4.

**PRO-PO Consistency Matrix:**

| Project Outcomes (PROs) | Programme Outcomes POs and PSOs |   |   |                                  |   |  |                |  |                               |  |                                 |                                |                                |  |
|-------------------------|---------------------------------|---|---|----------------------------------|---|--|----------------|--|-------------------------------|--|---------------------------------|--------------------------------|--------------------------------|--|
|                         | PO 1<br>Basic<br>knowl<br>edge  | PO 2<br>Discip<br>line<br>knowl<br>edge | PO 3<br>Exper<br>iment<br>s and<br>practi<br>ce | PO 4<br>Engin<br>eering<br>Tools | PO 5<br>The<br>engin<br>eer<br>and<br>societ<br>y | PO 6<br>Envir<br>onme<br>nt<br>and<br>sustai<br>nabili<br>ty | PO 7<br>Ethics | PO 8<br>Indivi<br>dual<br>and<br>team<br>work: | PO 9<br>Com<br>munic<br>ation | PO 10<br>Life-<br>long<br>learni<br>ng | PSO1<br>Plan<br>&<br>Desig<br>n | PSO2<br>Data<br>Collec<br>tion | PSO3<br>Anlysi<br>s of<br>data | PSO4<br>Proble<br>m<br>Solvin<br>g on<br>field |
| 1.....                  |                                 |   |   |                                  |   |  |                |  |                               |  |                                 |                                |                                |  |
| 2.....                  |                                 |   |   |                                  |   |  |                |  |                               |  |                                 |                                |                                |  |
| 3.....                  |                                 |   |   |                                  |   |  |                |  |                               |  |                                 |                                |                                |  |

**Details of Students' Group :** Project Batch -.....

| Sr. No. | Full name of student<br>(Beginning with surname) | Roll No. | Role in the project |            |
|---------|--|----------|---------------------|------------|
|         |  |          | General             | Particular |
| 1.      |  |          |                     | Leader     |
| 2.      |  |          |                     |            |
| 3.      |  |          |                     |            |
| 4.      |  |          |                     |            |
| ...     |  |          |                     |            |

**Detailed Planning of Project Work:**

| S N | Activity  | Details   | Date of completion |
|-----|---|---|--------------------|
| 1.  | Finalization of students' groups and assignment of project guide (Performa P-1) | Policy to be decided by programme department  |                    |
| 2.  | Identification and finalization of topic (Performa P-1)                         | <ul style="list-style-type: none"> <li>Review of previous projects</li> <li>Brain storming session for project ideas</li> <li>Internet search for topic</li> <li>Industry / field problem search</li> </ul> |                    |
| 3.  | Preparation and presentation of project synopsis including project completion   | <ul style="list-style-type: none"> <li>Synopsis ** to be submitted by group in printed form in prescribed format</li> </ul>   |                    |

|    |  |   |  |
|----|--|---|--|
|    | plan<br>(Performa P-2)                                 | <ul style="list-style-type: none"><li>• Synopsis to be presented by group in ppt presentation in front of faculty dean and project guide</li><li>• Assessment as per prescribed rubrics</li></ul> |  |
| 4. | Demonstration-1 (term-1 end)<br>(Performa P-3)         | PowerPoint presentation to be assessed as per prescribed rubrics  |  |
| 5. | Demonstration-2 (mid-term-2 end)<br>(Performa P-4)     | PowerPoint presentation to be assessed as per prescribed rubrics  |  |
| 6. | Presentation of final project report<br>(Performa P-5) | <ul style="list-style-type: none"><li>• Submission of final project report with conclusion of project</li><li>• PowerPoint presentation</li><li>• Assessment as per prescribed rubrics</li></ul>  |  |
| 7. | Final examination                                      | As per curriculum specifications  |  |

\*\*Synopsis shall contain the following:

1. Cover page
2. Index
3. Project Sheet
4. Activity schedule for project work

Name and signature of Project Guide

Name and signature of Programme Dean

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**Performa P-2**

**FINALIZATION OF PROJECT GROUPS, TOPICS AND GUIDES**

**Programme :**

**Academic Year :**

**Class :**

**Date :**

| S<br>N | Project<br>Group<br>ID | Project Group |                   | Title of Project | Name of<br>Project Guide | Type of Project<br>(Product making<br>/ research /<br>problem solving /<br>industry based /<br>etc.) |
|--------|------------------------|---------------|-------------------|------------------|--------------------------|--|
|        |                        | Roll<br>No.   | Names of Students |                  |                          |  |
| 1.     |                        |               |                   |                  |                          |  |
| 2.     |                        |               |                   |                  |                          |  |
| 3.     |                        |               |                   |                  |                          |  |
| 4.     |                        |               |                   |                  |                          |  |
| 5.     |                        |               |                   |                  |                          |  |
| 6.     |                        |               |                   |                  |                          |  |
| 7.     |                        |               |                   |                  |                          |  |
| ...    |                        |               |                   |                  |                          |  |

**Name and signature of Programme Dean**



**GOVERNMENT POLYTECHNIC, KOLHAPUR**  
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**Performa P-3**

**ASSESSMENT RUBRICS FOR SYNOPSIS OF PROJECT**

**Programme :**

**Academic Year :**

**Title of Project :**

**Project Group ID :**

**Name of Project Guide :**

**Date :**

| S<br>N                      | Assessment<br>point | Performance grades and their meaning for each<br>assessment point |             |             |                     |                  | Assessment point-wise score (out of 5) of each student in project<br>group |              |               |                |                |                |                |
|-----------------------------|---------------------|---|-------------|-------------|---------------------|------------------|--|--------------|---------------|----------------|----------------|----------------|----------------|
|                             |                     | Poor<br>(1)   | Fair<br>(2) | Good<br>(3) | Very<br>Good<br>(4) | Excellent<br>(5) | Roll<br>No.:   | Roll<br>No.: | Roll<br>No.:  | Roll<br>No.:   | Roll<br>No. :  | Roll<br>No. :  | Roll<br>No. :  |
| 1                           |                     |   |             |             |                     |                  | .....<br>....  | .....<br>.   | .....<br>.... | .....<br>..... | .....<br>..... | .....<br>..... | .....<br>..... |
| 2                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 3                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 4                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 5                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 6                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 7                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 8                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 9                           |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| 10                          |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |
| <b>TOTAL SCORE &gt;&gt;</b> |                     |   |             |             |                     |                  |  |              |               |                |                |                |                |

**Project Guide**

**Programme Dean**

**GOVERNMENT POLYTECHNIC, KOLHAPUR**

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**Performa P-4**

**ASSESSMENT RUBRICS FOR DEMONSTRATION-1 OF PROJECT**

**Programme :**

**Academic Year :**

**Title of Project :**

**Project Group ID :**

**Name of Project Guide :**

**Date :**

| S<br>N                      | Assessment<br>point | Performance grades and their meaning for each<br>assessment point |             |             |                     |                  | Assessment point-wise score (out of 5) of each student in project<br>group |              |              |              |              |              |              |
|-----------------------------|---------------------|---|-------------|-------------|---------------------|------------------|--|--------------|--------------|--------------|--------------|--------------|--------------|
|                             |                     | Poor<br>(1)   | Fair<br>(2) | Good<br>(3) | Very<br>Good<br>(4) | Excellent<br>(5) | Roll<br>No.:   | Roll<br>No.: | Roll<br>No.: | Roll<br>No.: | Roll<br>No.: | Roll<br>No.: | Roll<br>No.: |
| 1                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 2                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 3                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 4                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 5                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 6                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 7                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 8                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 9                           |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| 10                          |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |
| <b>TOTAL SCORE &gt;&gt;</b> |                     |   |             |             |                     |                  |  |              |              |              |              |              |              |

**Project Guide**

**Programme Dean**

**GOVERNMENT POLYTECHNIC, KOLHAPUR**

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**Performa P-5**

**ASSESSMENT RUBRICS FOR DEMONSTRATION-2 OF PROJECT**

**Programme :**

**Academic Year :**

**Title of Project :**

**Project Group ID :**

**Name of Project Guide :**

**Date :**

| S<br>N                      | Assessment<br>point | Performance grades and their meaning for each<br>assessment point |             |             |                     |                  | Assessment point-wise score (out of 5) of each student in project<br>group |              |              |              |               |               |               |
|-----------------------------|---------------------|---|-------------|-------------|---------------------|------------------|--|--------------|--------------|--------------|---------------|---------------|---------------|
|                             |                     | Poor<br>(1)   | Fair<br>(2) | Good<br>(3) | Very<br>Good<br>(4) | Excellent<br>(5) | Roll<br>No.:   | Roll<br>No.: | Roll<br>No.: | Roll<br>No.: | Roll<br>No. : | Roll<br>No. : | Roll<br>No. : |
| 1                           |                     |   |             |             |                     |                  | .....  | .....        | .....        | .....        | .....         | .....         | .....         |
| 2                           |                     |   |             |             |                     |                  | ....   | .            | ....         |              |               |               |               |
| 3                           |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| 4                           |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| 5                           |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| 7                           |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| 8                           |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| 9                           |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| 10                          |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |
| <b>TOTAL SCORE &gt;&gt;</b> |                     |   |             |             |                     |                  |  |              |              |              |               |               |               |

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**GOVERNMENT POLYTECHNIC, KOLHAPUR**  
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**Performa P-6**

**ASSESSMENT RUBRICS FOR FINAL PRESENTATION OF PROJECT**

**Programme :** \_\_\_\_\_ **Academic Year :** \_\_\_\_\_ **Title of Project :** \_\_\_\_\_  
**Project Group ID :** \_\_\_\_\_ **Name of Project Guide :** \_\_\_\_\_ **Date :** \_\_\_\_\_

| SN                          | Assessment point | Performance grades and their meaning for each assessment point |          |          |               |               | Assessment point-wise score (out of 5) of each student in project group |           |           |           |           |           |           |
|-----------------------------|------------------|--|----------|----------|---------------|---------------|---|-----------|-----------|-----------|-----------|-----------|-----------|
|                             |                  | Poor (1)   | Fair (2) | Good (3) | Very Good (4) | Excellent (5) | Roll No.:   | Roll No.: | Roll No.: | Roll No.: | Roll No.: | Roll No.: | Roll No.: |
| 1                           |                  |  |          |          |               |               | .....   | .....     | .....     | .....     | .....     | .....     | .....     |
| 2                           |                  |  |          |          |               |               | ....  | .         | ....      | .....     | .....     | .....     | .....     |
| 3                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 4                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 5                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 6                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 7                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 8                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 9                           |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| 10                          |                  |  |          |          |               |               |   |           |           |           |           |           |           |
| <b>TOTAL SCORE &gt;&gt;</b> |                  |  |          |          |               |               |   |           |           |           |           |           |           |

Project Guide

Programme Dean

**COURSE ID :**

**Course Name** : CONSTRUCTION MANAGEMENT  
**Course Code** : CEG503  
**Course Abbreviation** : GCNM

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : <nil >

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 03      |
| Practical        | -            |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                     |           | Term End Examination            |           | Total |
|-----------------------|--|-----------|---------------------------------|-----------|-------|
|                       | Theory   | Practical | Theory Examination              | Practical |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | --        | Term End Theory Exam (03 hours) | --        |       |
| Marks                 | 20   | --        | 80                              | --        | 100   |

**RATIONALE:**

This is one of the important management level subject. Civil Engineering technician in charge of construction work, and as a supervisor acts as a link between skilled and semi-skilled workers and top management engineers. He has to solve the various problems arising at the site and guide the workers and ensure efficient use of resources i.e. men, machines, material, money, and time. He must be acquainted with different aspects of management, particularly in relation to construction. He has to provide good leadership to people working under him. This subject is intended to provide reasonably sufficient background regarding management in general and of civil engineering work.

**COMPETENCY**

- Manage various resources for optimised completion of construction projects.

**Cognitive:** Understanding and applying concepts, principles of management at construction site

**Psychomotor:** i) Prepare bar chart and cpm network ii) Draft tender notice for various types of construction.

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation vi) Civic sense

**COURSE OUTCOMES:**

- CEG503-1** Understand the characteristics, stages and persons related to civil engineering works  
**CEG503-2** - Understand nature of Management, principles and functions of management  
**CEG503-3** Understand and Prepare networks and bar charts for the given construction project  
**CEG503-4** Understand human resources management and laws related to civil engg.works  
**CEG503-5** Understand the materials management and importance of inventory management  
**CEG503-6** Understand the work study and how to increase productivity, Apply safety measures at construction projects.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Programme Outcomes POs and PSOs  |   |                          |   |  |   |                            |                            |                          |                                      |                                  |
|--|---|--------------------------|---|--|---|----------------------------|----------------------------|--------------------------|--------------------------------------|----------------------------------|
| Competency and COs   | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO 1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency: Manage various resources for optimised completion of civil engineering projects</b>                         | 2   | 3                        | 3                                       | 1  | 2   | 3                          | 2                          | 3                        | 2                                    | 2                                |
| <b>CEG503-1</b> Understand the characteristics ,stages and persons related to civil engineering works                      | 2   | 2                        | 2                                       |  | 3   |                            | 2                          | 2                        | 2                                    | 3                                |
| <b>CEG503-2</b> - Understand nature of Management, principles and functions of management.                                 | 3   | 2                        | 3                                       |  | 3   |                            | 2                          | 2                        | 3                                    | 3                                |
| <b>CEG503-3</b> Understand and Prepare networks and bar charts for the given construction project .                        | 3   | 3                        | 3                                       |  | 2   |                            | 2                          | 2                        | 3                                    | 3                                |
| <b>CEG503-4</b> understand human resources management and laws related to civil engg.works                                 | 3   | 3                        | 3                                       |  | 2   |                            | 2                          | 2                        | 3                                    | 3                                |
| <b>CEG503-5</b> Understand the materials management and importance of inventory management                                 | 3   | 3                        | 3                                       |  | 2   |                            | 2                          | 2                        | 3                                    | 3                                |
| <b>CEG503-6</b> Understand the workstudy and how to increase productivity , Apply safety measures at construction projects | 3   | 3                        | 3                                       |  | 2   |                            | 2                          | 2                        | 3                                    | 3                                |

**CONTENT : THEORY**

**Section – I**

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>CEG503-1</b> Understand the characteristics ,stages and persons related to civil engineering works |  |                  |                           |
| <b>1</b>  | <p><b>Civil engineering construction industry</b></p> <p>1.1 Importance of construction industry in national development, Special characteristics of civil engineering works and classification of works</p> <p>1.2 Stage in construction work. such as pre-tender, post-tender, design, drawing, estimation, tendering etc., planning for execution, procuring material, supervision, inspection, payment and maintenance.</p> <p>1.3 Agencies associated with construction work and their duties and responsibilities.</p>   | <b>04</b>        | <b>06</b>                 |
| <b>CEG503-2 -</b> Understand nature of Management, principles and functions of management             |  |                  |                           |
| <b>2.</b>   | <p><b>Management and functions of management</b></p> <p><b>2.1 Management</b></p> <p>2.1.1 Concept and Objectives of management</p> <p>2.1.2 Principles of management</p> <p>2.1.3 Levels of management</p> <p>2.1.4 Managerial competencies : Communication, Planning and Administration, Team work, Strategic action and General awareness.</p> <p><b>2.2 Functions of Management</b></p> <p>2.2.1 Planning: Forms of planning, Strategic levels and Planning, Phases of Planning</p> <p>2.2.2 Decision Making: Decision making conditions, Basic types of Decisions</p> <p>2.2.3 Organizing: Introduction to Organization design, basic types of Departmentalization, Co-ordination, Authority</p> <p>2.2.4 Motivation: Work Motivation, Three approaches to Motivation,</p> <p>2.2.5 Leadership: Leadership and Power, Leadership Development</p> <p>2.2.6 Communication: The Communication process, Impact of Information Technology, Hurdles to effective communication</p> <p>2.2.7 Controlling: Foundations of control, creative Effective control, Primary methods of control</p> | <b>14</b>        | <b>26</b>                 |

| <b>CEG503-3</b> Understand and Prepare networks and bar charts for the given construction project.  |  |           |           |
|---|--|-----------|-----------|
| <b>3</b>  | <b>MODERN MANAGEMENT TECHNIQUES</b><br>3.1 PERT & CPM<br>3.2 Various terms related with network analysis<br>3.3 Various Time estimates<br>3.4 Construction of Network Diagram<br>3.5 Computation of Critical Path. | <b>06</b> | <b>08</b> |
|   | <b>Total</b>   | <b>24</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |  |           |           |

### Section II

| <b>Sr. No.</b>  | <b>Topics / Sub-topics</b>   | <b>Lectures (Hours)</b> | <b>Theory Evaluation (Marks)</b> |
|---|--|-------------------------|----------------------------------|
| <b>CEG503-4</b> understand human resources management and laws related to civil engg. works |  |                         |                                  |
| <b>04</b>   | <b>HUMAN RESOURCE MANAGEMENT (Personnel Management)</b><br>4.1 Definition and concept,<br>4.2 Aim, Objectives and functions of HR dept.<br>4.2 Principles of personnel policy, details recorded in policy<br>4.3 Recruitment and selection of employees<br>4.4 Training : Objectives, benefits, types and methods<br>4.5 Workers Participation in Management<br><br>Importance & Provision of important acts/ Laws related to construction activity such as Factory act, Minimum wages act, Workmens compensation act, Labour Welfare Activities | <b>07</b>               | <b>12</b>                        |
| <b>CEG503-5</b> Understand the materials management and importance of inventory management  |  |                         |                                  |
| <b>05</b>   | <b>MATERIALS MANAGEMENT</b><br><br>5.1 Scope and importance of material management<br>5.2 Objectives of material management<br>5.3 Duties of Material manager<br>5.4 Importance of purchase and Duties of purchasing officer<br>5.5 Inventory management and Techniques such as ABC analysis, EOQ<br>5.6 Modern trends in material management JIT/SAP / ERP etc.   | <b>07</b>               | <b>12</b>                        |



|   |  |           |           |
|---|--|-----------|-----------|
| <b>CEG503-6</b> Understand the work study and how to increase productivity, Apply safety measures at construction projects  |  |           |           |
| <b>06</b>   | <b>Work study , productivity and safety in civil engg.works</b><br><br><b>6.1 Work study , productivity</b><br><br>6.1.1 Concept of productivity<br>6.1.2 Definition & objective of work study<br>6.1.3 Method study – definition, objectives, stages in method study, recording, techniques and symbols used.<br>6.1.4 Work measurement – definition, uses, steps involved, standard time & various allowances etc<br><br><b>6.2 Safety in civil engg.</b><br>6.2.1 Importance of safety<br>6.2.2 Terms used – accident cost, injury frequency rate<br>6.2.3 Common causes relating to accidents at construction site,<br>6.2.4 Precautions to be taken to avoid accidents<br>6.2.5 Safety program and safety audit | <b>10</b> | <b>16</b> |
|   | <b>Total</b>   | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic   | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---|--|------------|-------------|----------------|-------------|
|           |   | Remember                                     | Understand | Application |                |             |
| 1         | Civil engineering construction industry               | 02   | 04         | 00          | CEG503-1       | 06          |
| 2         | Management and Functions of management                | 08   | 10         | 08          | CEG503-2       | 26          |
| 3         | Modern management techniques                          | 00   | 04         | 04          | CEG503-3       | 08          |
| 4         | Human resource management management)                 | 06   | 06         | 00          | CEG503-4       | 12          |
| 5         | Materials management                                  | 04   | 04         | 04          | CEG503-5       | 12          |
| 6         | Workstudy,productivity and safety in civil engg.works | 04   | 06         | 06          | CEG503-6       | 16          |
|           | Total   | 24   | 34         | 22          | -----          | 80          |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**J) INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure   | Topic                                   |
|----|--|---|
| 1. | Collecting tender notices from news papers, collecting tender documents from PWD office for study. | Topic no.3-Tender and tender documents. |

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations
3. Question Bank
4. Tender notices from news papers , tender documents from PWD office for study.

**REFERENCE MATERIAL :**

**Reference Books / Journals / IS Codes**

| Sr. No. | Author           | Title                                  | Publisher                      |
|---------|------------------|--|--------------------------------|
| 1.      | B. V. Pathak     | Construction Management                | Nirali Prakashan Pune          |
| 2.      | Harpal Sigh      | Construction Management                | Tata Mc. Graw Hill, New Delhi. |
| 3.      | Deodhar          | Construction Management                | Vrinda Publication, Jalgaon.   |
| 4.      | Banga and Sharma | Industrial Organization and Economics  | Khanna Publishers, New Delhi.  |
| 5.      | Dr. O. P. Khanna | Industrial Organization and Management | Dhanpat Rai and Sons, Delhi    |

**COURSE ID :**

**Course Name : CONTRACTS AND ACCOUNTS**

**Course Code : CEG504**

**Course Abbreviation : GCAA**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 03      |
| Practical        | -            |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                                     |           | Term End Examination            |           | Total |
|-----------------------|--|-----------|---------------------------------|-----------|-------|
|                       | Theory   | Practical | Theory Examination              | Practical |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | --        | Term End Theory Exam (03 hours) | --        |       |
| Marks                 | 20   | --        | 80                              | --        | 100   |

**RATIONALE:**

This is a core technology subject which will enable the students to learn facts, concepts, principles and procedure in contracts and accounts. With this knowledge and skill, he will be able to prepare tender papers for contract and contract documentation before start of construction.

He will get acquainted with procedures and different forms used by PWD as well as private construction firms and will therefore be able to prepare bills and pay contractor for the work.

**COMPETENCY**

Apply facts, concepts, principles and procedure in contracts and accounting process.

**Cognitive:** Understanding and applying facts, concepts, principles and procedure in contracts and accounting process to administer departmental official procedure.

**Psychomotor:** i) Prepare tender document ii) Draft tender notice for various types of construction.

**Affective: Attitude** of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

vi) Civic sense

**COURSE OUTCOMES :**

- CEG504-1** Execute the methods of PWD procedure for initiating the civil works.  
**CEG504-2** Execute the appropriate types of Contract for civil engineering works .  
**CEG504-3** Prepare tender documents for civil engineering works.  
**CEG504-4** Execute functions of financial management,types of budgets and taxes.  
**CEG504-5** Know PWD accounting procedure and to make payment to contractor and supplier.  
**CEG504-6** Justify Valuation and rent fixation of civil structure.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Programme Outcomes POs and PSOs   |   |                       |                                      |   |   |                         |                         |                       |                                    |                               |
|---|---|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|-----------------------|------------------------------------|-------------------------------|
| Competency and COs  | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO5Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PS O1 Plan and Design | PS O2 Construction and Maintenance | PSO3 Problem Solving on field |
| <b>Competency:</b> Apply facts, concepts, principles and procedure in contracts and accounting process. | 3   | 3                     | 2                                    | 1   | 2   | 1                       | 2                       | 2                     | 1                                  | 3                             |
| <b>CEG504-1</b> Execute the methods of PWD procedure for initiating the civil works.                    | 2   | 2                     | 2                                    | 2   | 3   | 1                       | 2                       | 2                     | 2                                  | 3                             |
| <b>CEG504-2</b> Execute the appropriate types of Contract for civil engineering works .                 | 3   | 2                     | 3                                    | 2   | 3   | 3                       | 2                       | 2                     | 3                                  | 3                             |
| <b>CEG504-3</b> Prepare tender documents for civil engineering works.                                   | 3   | 3                     | 3                                    | 3   | 2   | 1                       | 2                       | 2                     | 3                                  | 3                             |
| <b>CEG504-4</b> Execute functions of financial management, types of budgets and taxes.                  | 3   | 3                     | 3                                    | 3   | 2   | 1                       | 2                       | 2                     | 3                                  | 3                             |
| <b>CEG504-5</b> Know PWD accounting procedure and to make payment to contractor and supplier.           | 3   | 3                     | 3                                    | 3   | 2   | 1                       | 2                       | 2                     | 3                                  | 3                             |
| <b>CEG504-6</b> Justify Valuation and rent fixation of civil structure.                                 | 3   | 3                     | 3                                    | 3   | 2   | 1                       | 2                       | 2                     | 3                                  | 3                             |

**CONTENT : THEORY**

**Section –**

| Sr. No.   | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>CEG504-1</b> Execute the methods of PWD procedure for initiating the civil works.  |   |                  |                           |
| <b>1</b>  | <p><b>PWD procedure and Methods of executing work.</b></p> <p>1.1 Classification of works-major work, minor work, special works and maintenance works.</p> <p>1.2 Organization structure of PWD.</p> <p>1.3 Methods of Execution of works-various methods adopted in Government organization such as, contracts method, Departmental method, rate list method , piecework method, day’s work method ,employment of labours on daily wages basis &amp; BOT.</p> <p>1.4 P.W.D. procedure of executing works- Proposal, Administrative approval, Technical sanction. Budget Provision, Expenditure sanction, method of execution, handing-over, maintenance.</p> <p>1.5 Duties and responsibilities of the Junior Engineer, Site Engineer in P.W.D.</p>  | <b>06</b>        | <b>12</b>                 |
| <b>CEG504-2</b> Execute the appropriate types of Contract for civil engineering work. |   |                  |                           |
| <b>2.</b>   | <p><b>Contracts and contract conditions.</b></p> <p><b>2.1 Contracts.</b></p> <p>2.1.1-Definition of contract, Essentials of valid contract, objects of contract, Contract documents.</p> <p>2.1.2-Types of Contracts, its meaning, advantages, disadvantages and suitability-Lump sum contract, item rate contract, Percentage rate contract, Cost plus percentage, cost plus variable percentage, Cost plus fixed fees, Cost plus variable fees, negotiated contract, target contract, Labour contract, Sub contract Demolition contract.</p> <p>2.1.3-Clasification of contractor on basis of financial limits, procedure for registration of contractor and documents required.</p> <p>2.1.4-Built operate transfer(BOT) project-objectives, scope, advantages, disadvantages etc.</p> <p><b>2.2-Conditions of Contract.</b></p> <p>2.2.1-Importance of conditions of contract</p> <p>2.2.2-Important conditions such as -Time limit and its importance,Extension of time limit, Defective material and workmanship,Liquidation of contract, liquidated and unliquidated damages, Defect liability period,Extra item, penalty,suspention of work, subletting of contract, supervision of work, Escalation of cost, termination of contract,</p> <p>2.2.3-Arbitration- Meaning, qualities of arbitrator, powers and duties of arbitrator, causes of dispute, arbitration procedure, Award of result.</p> | <b>10</b>        | <b>16</b>                 |

| <b>CEG504-3</b> Prepare tender documents for civil engineering works.   |  |           |           |
|---|--|-----------|-----------|
| <b>3</b>  | <p><b>Tender and tender Documents.</b></p> <p>3.1-Definition of tender, necessity of tender<br/>3.2-Classification of tender- local, Global, open limited and negotiated.<br/>3.3-Notice inviting tender- definition of tender notice, necessity of tender notice, Points to be included while drafting tender notice. Drafting of tender notice.<br/>3.4-Meaning of terms-Security deposit, Earnest money deposit(EMD), Validity Period, right to reject one or all tenders. rejection of lowest tender, rejection of all tenders. Corrigendum to tender notice &amp; its necessity.<br/>3.5- Tender documents- Index, tender notice, general instructions, special instructions, Drawing. Specifications, Schedule-A, Schedule-B, Schedule-C, contract conditions.<br/>3.6-Filling up of Tender by Contractor and Points observed by him.<br/>3.7-Procedure of submitting tender- Two envelop method<br/>3.8-Procedure of opening tender- Preparing comparative statement, Scrutiny of tenders, acceptance of tender, award of contract, work order.<br/>3.9-E-Tendering-Online procedure of submitting tender.<br/>3.10-Meaning of-Unbalanced tender, Ring formation.</p> | <b>08</b> | <b>12</b> |
|   | <b>Total</b>   | <b>24</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |  |           |           |

### Section II

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>CEG504-4</b> Execute functions of financial management, types of budgets and taxes. |  |                  |                           |
| <b>4</b>   | <p><b>Financial management.</b></p> <p>4.1- Financial management-Objectives and Functions<br/><br/>4.2-Capital generation and management- Types of Capitals, Sources of finance.<br/><br/>4.3-Budgets and accounts-Types of budgets and accounts, Preparation of profit and loss, Balance sheet.<br/><br/>4.4-Taxes and Tax registration-Introduction to Income tax, GST, Royalty tax.</p> | <b>06</b>        | <b>10</b>                 |

|   |  |           |           |
|---|--|-----------|-----------|
| <b>CEG504-5</b> Know PWD accounting procedure and to make payment to contractor and supplier.   |  |           |           |
| <b>5</b>  | <b>P.W.D. accounts And Payment to suppliers and contractors.</b><br><br>5.1-Varous account forms and their uses<br>5.2-Documents maintained in P .W.D. such as, Work order book, Daily-diary, Nominal Muster Roll(NMR), Measurement book(MB), Imprest cash, Indents, Daily Labour report, Work abstract, cash abstract, Invoice, Bills, voucher, temporary advance, heads of accounts<br>5.3-Mode of Payment to contractor, its necessity. Running account bills, Secured advance, Advance payment, Petty advance, Mobilization advance, Interim payment, final payment, First & Final Payment, retention money, reduce rate payments,E-payment.   | <b>06</b> | <b>10</b> |
| <b>CEG504-6</b> Justify Valuation and rent fixation of civil structure.   |  |           |           |
| <b>6</b>  | <b>Valuations.</b><br>6.1-Definition, Necessity(purpose)of Valuation.Role of Valuer. Definitions – Cost ,Price and Value, Difference Between Them, Characteristics of Value, Factors Affecting Value.<br><br>6.2-Types Of Value:-Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value ,Market Value , Monopoly Value, Sentimental Value, Factors Affecting Value.<br><br>6.3-Depreciation, Obsolescence, Sinking Fund .Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method Quantity Survey Method.<br><br>6.4-Computation Of Capitalized Value, Gross Income, Outgoing, Net Income, Years Purchase. Types of Outgoing And Their Percentages.<br><br>6.5-Valuation Of Lands & Buildings , Factors Affecting Their Valuation, Book Value Method, Replacement Value Method And Comparison Method. Use of Valuation Tables .Deferred Value Of Land.<br><br>6.6-Fixation of Rent As Per PWD Practice. | <b>12</b> | <b>20</b> |
|   | <b>Total</b>   | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No.    | Name of topic                                | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|--------------|--|--|------------|-------------|----------------|-------------|
|              |  | Remember                                     | Understand | Application |                |             |
| 1            | PWD procedure and Methods of executing work. | 02   | 04         | 06          | CEG504-1       | 12          |
| 2            | Contracts and contract conditions.           | 03   | 04         | 09          | CEG504-2       | 16          |
| 3            | Tender and tender Documents.                 | 03   | 03         | 06          | CEG504-3       | 12          |
| 4            | Financial management.                        | 02   | 04         | 04          | CEG504-4       | 10          |
| 5            | P.W.D. accounts And Payment to suppliers and | 03   | 03         | 04          | CEG504-5       | 10          |
| 6            | Valuations.                                  | 04   | 06         | 10          | CEG504-6       | 20          |
| <b>TOTAL</b> |  | <b>17</b>                                    | <b>24</b>  | <b>39</b>   | -----          | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**K) INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure   | Topic                                   |
|----|--|---|
| 1. | Collecting tender notices from news papers, collecting tender documents from PWD office for study. | Topic no.3-Tender and tender documents. |

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning**

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Question Bank
4. Tender notices from news papers , tender documents from PWD office for study.

**REFERENCE MATERIAL :**



**Reference Books / Journals / IS Codes**

| <b>Sr. No.</b> | <b>Author</b>              | <b>Title</b>  | <b>Publisher</b>                                   |
|----------------|----------------------------|---|--|
| 1.             | B. N. Datta                | Estimating and costing  | U B S Publishers Distributers Pvt. Ltd., New Delhi |
| 2.             | M. Chakraborti             | Estimating and costing, Specification and Valuation                           | M. Chakraborti, Calcutta                           |
| 3.             | S. C. Rangwala             | Elements of Estimating and costing  | Charator Publication, Anand                        |
| 4.             | B. S. Patil                | Civil Engg.Contracts& estimates   | Orient Longman, Mumbai                             |
| 5.             | G. S. Birdi                | Test Book of Estimating & costing   | Dhanpat Rai & Sons, Delhi                          |
| 6              | R. H. Nanavati             | Valuation   |  |
| 7              | S. C. Rangwala             | Valuation   | Charator Publication, Anand                        |
| 8              | Bureau of Indian Standards | Standard mode of Measurement for Building - I.S.1200                          | Bureau of Indian Standards                         |
| 9              | Bureau of Indian Standards | S.P. 13 I.S. 7272 Part – I  | Bureau of Indian Standards                         |
| 10             | Govt. of Maharashtra       | P.W. and Housing Department, Govt.of Maharashtra, Vol.I (1979), Vol.II (1981) | Govt. of Maharashtra                               |

**COURSE ID :**

**Course Name : ENVIRONMENTAL ENGINEERING**  
**Course Code : CEG505**  
**Course Abbreviation : GENE**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 04           | 06      |
| Practical        | 02           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                     |   | Term End Examination            |                     | Total |
|-----------------------|--|---|---------------------------------|---------------------|-------|
|                       | Theory   | Oral                                    | Theory Examination              | Oral                |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | One Progressive Skill Tests of 25 marks | Term End Theory Exam (03 hours) | As per Proforma-III |       |
| Marks                 | 20   | 25                                      | 80                              | 50 E                | 150   |

\*\* Assessment of oral as per Pro-forma –III (To be assessed by internal and external examiner)

**RATIONALE:**

Water is the basic need for all living beings. Water plays a critical role in maintaining a balance between living things and the environment in which they live. The quest for pure water can benefit the life and health of every one. Water purification is now confronted with myriad of difficulties. Problems caused due to sources receiving greatly increased pollution loads of domestic and industrial wastes. The water supply and drainage schemes are being commissioned on large scale so as to make water available for drinking, industrial use and provide drainage arrangement at all places in rural and urban areas. This subject is intended to teach the students, the concepts, principles and constructional procedures to understand various water supply and sanitary engineering Schemes; which will enable them to apply this knowledge for design, construction and supervise the various elements of construction related to water supply and sanitary engineering projects.

**COMPETENCY**

Apply principles of environmental engineering (water supply and sanitary engineering) to solve engineering problems as follows.

**Cognitive:** Understanding and applying principles of environmental engineering to engineering problems.

**Psychomotor:** i) Operating Digital instruments during experimental work ii) Handling chemicals and preparation of chemical solutions.

**Affective: Attitude** of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation  
vii) Hygiene vii) civic sense

**COURSE OUTCOMES (COs):**

**CEG505-1** Identify the sources of water, forecast population, estimate quantity and analyze quality of Water.

**CEG505-2** Know the standards of purity of water, Understand water purification process and design, Construction and maintenance aspects of treatment units.

**CEG505-3** Understand systems of conveyance and distribution of water and identify relevant types of valves.

**CEG505-4** Know the principles of sanitation and objects of sewage disposal, identify the sources of Waste water, Draw labeled system of plumbing for building sanitation. Know the methods of Collection and disposal of dry refuse (solid waste) in villages and towns

**CEG505-5** Know the methods of carrying sewage and Understand design, construction and maintenance of water carriage system of sewerage.

**CEG505-6** Understand analysis of sewage and Suggest waste water treatment.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Programme Outcomes POs and PSOs  |   |                       |                                       |  |  |                         |                         |                      |                                     |                               |
|--|---|-----------------------|---------------------------------------|--|--|-------------------------|-------------------------|----------------------|-------------------------------------|-------------------------------|
| Competency and COs   | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/dev elopment of solutions | PO 4 Engineering Tools, Experiment ation & Testing | PO5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construc tion and Maintena nce | PSO3 Problem Solving on field |
| <b>Competency:</b> Apply principles of environmental engineering (water supply and sanitary engineering)to solve engineering problems.   | 3   | 3                     | 3                                     | 2  | 2  | 2                       | 2                       | 3                    | 3                                   | 2                             |
| <b>CEG505-1</b> Identifythe sources of water,forecast population,estimate quantity and analyze quality of water.   | 3   | 3                     | 3                                     | 2  | 1  | 2                       | 2                       | 3                    | 1                                   | 2                             |
| <b>CEG505-2</b> Know the standards of purity of water, Understand water purification process and design, construction and maintenance aspects of treatment units.  | 3   | 3                     | 2                                     | 2  | 2  | 2                       | 2                       | 3                    | 3                                   | 2                             |
| <b>CEG505-3</b> Understand systems of conveyance and distribution of water and identify relevant types of valves.  | 3   | 3                     | 3                                     | 2  | 2  | 2                       | 2                       | 3                    | 3                                   | 2                             |
| <b>CEG505-4</b> Know the principles of sanitation and objects of sewage disposal, identify the sources of waste water, Draw labeled system of plumbing for building sanitation. Know the methods of collection and disposal of dry refuse (solid waste) in villages and towns. | 3   | 3                     | 3                                     | 2  | 2  | 1                       | 1                       | 3                    | 3                                   | 2                             |
| <b>CEG505-5</b> Know the methods of carrying sewage andUnderstand design, construction and maintenance of water carriage system of sewerage.   | 3   | 3                     | 3                                     | 2  | 2  | 2                       | 2                       | 3                    | 3                                   | 2                             |
| <b>CEG505-6</b> Understand analysis of sewage and Suggest waste water treatment.   | 3   | 3                     | 3                                     | 2  | 2  | 2                       | 2                       | 3                    | 3                                   | 1                             |

## PRACTICALS/EXERCISES

### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:

Practical work is divided in three parts as below –

- 1) Field visits.
- 2) Assignment work.
- 3) Experimental work.

| Sr No. | Title of Practical Exercise   | Skills / Competencies to be developed  | Course Outcome                            |
|--------|---|--|---|
| 1      | <p><b>Field visits –</b></p> <p>1. Visit to Water treatment plant to study the working of various treatment units and treatment processes. Draw the flow diagram and prepare detailed visit report .</p> <p>2. Visit to a Sewage treatment plant to study the working of various treatment units and treatment processes. Draw the flow diagram and prepare detailed visit report.</p>  | <ol style="list-style-type: none"> <li>1. Information collection and presentation in the form of report.</li> <li>2. Motivation through field exposure.</li> </ol>               | <p>CEG505-2<br/>CEG505-6</p>              |
| 2      | <p><b>Assignment work-</b></p> <p>1) Collecting data regarding population of any city/village and forecast population after three decades by various methods. Select the result and find out the total water demand for that city/village.</p> <p>2) Design the Septic Tank for the public building such as hostel or hospital. Draw plan and section of the same along with the the drainage arrangement in soak pit</p>   | <ol style="list-style-type: none"> <li>2. Developing self learning ability.</li> <li>3. Plotting and interpreting graphs.</li> <li>4. Developing Presentation skills.</li> </ol> | <p>CEG505-1<br/>CEG505-5<br/>CCF110-4</p> |
| 3      | <p><b>Experimental work–</b></p> <p><b>Water supply engineering-</b><br/>Conduct test on water sample to determine its-</p> <ol style="list-style-type: none"> <li>1) Turbidity. By turbidimeter</li> <li>2) Temporary, Permanent and Total Hardness. By titration.</li> <li>3) PH value by using--i) Universal indicator- ii) PH paper- iii) Digital PH meter-</li> <li>4) Chloride concentration. By titration.</li> <li>5) Residual Chlorine by O.T. / S. O. test.</li> <li>6) Dissolve Oxygen. By using D.O. meter</li> </ol> <p><b>Sanitary engineering-</b><br/>Conduct test on waste -water sample to determine its-</p> <ol style="list-style-type: none"> <li>1) Dissolve Oxygen content.</li> <li>2) pH value</li> <li>3) B.O.D.</li> </ol> | <ol style="list-style-type: none"> <li>1. Taking readings and assessing quality of water sample.</li> <li>2. Taking readings and assessing quality of sewage sample</li> </ol>   | <p>CEG505-1</p> <p>CEG505-6</p>           |

|   |   |  |  |
|---|---|--|--|
| 4 | <p><b>Suggested Micro-projects:</b></p> <p><b>Any one project for group of three to five students.</b></p> <p>1) Visit to residential / public building to study different systems of plumbing and sanitary fittings like W.C., Urinals, Flushing Cisterns, Traps, I.C. etc. and prepare the lay-out-plan of house drainage system and show all details like sanitary units , traps, pipes, drains, I.C. etc.</p> <p>2) Test the water sample from bore well/ tap water/raw water from nearby river, pond etc. to determine its characteristics.</p> <p>3) Test the waste-water sample from Locally available area to determine its characteristics.</p> <p>4) Study of local water sources and suggest the remedial measures for control of its pollution.</p> <p>5) Visit and preparation of detailed report on site where recycling and utilization of treated waste-water is being implemented.</p> | <p>1.Information collection and presentation in the form of report.</p> <p>2.Motivation through field exposure.</p> <p>3.Developing self learning ability.</p> |  |
|---|---|--|--|

**CONTENT: THEORY Section – I (Water supply Engineering)**

| Sr. No  | Topics / Sub-topics   | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---|------------------|---------------------------|
| <b>Course Outcome- CEG505-1</b> Identify the sources of water, forecast population, estimate quantity and analyze quality of water. |   |                  |                           |
| 1   | <p><b>Water sources, quantity and water analysis.</b></p> <p><b>1.1-Sources of Water Supply-</b><br/>           1.1.1-surface and sub-surface sources like river, lake, canal, reservoir, impounding reservoir and open well, tube well, springs, artesian well, infiltration gallery (only brief idea). Requirements of source of water.<br/>           1.1.2- Necessity of water supply scheme.<br/>           1.1.3-Need for protected water supply,waterborne diseases.<br/>           1.1.4-Intake structures –definition, types -river intake reservoir intake, canal intake. Factors governing the location of intake.<br/>           1.1.5-Flow diagram of water supply scheme from source to Consumer</p> <p><b>1.2-Water Demand and Its Quantity Estimation –</b><br/>           1.2.1- Water demand-Types of demands- domestic, public, industrial, commercial, fire, losses and waste ; minimum requirements as per IS -1172<br/>           1.2.2- Factors affecting rate of demand<br/>           1.2.3- Variation in rate of demand –Hourly ,Daily , Monthly and seasonal variations .Per capita demand , Design period<br/>           1.2.4- Estimating population-Methods of population forecasting (only introduction no mathematical problems ask in examination) Necessity of population Forecasting.</p> <p><b>1.3-Quality of Water –</b><br/>           1.3.1-Meaning of term potable /wholesome water<br/>           1.3.2-Impurities present in water and its classification.<br/>           1.3.3-Water analysis –Need, Characteristics of water and Tests on water : physical tests – temperature, colour, turbidity, taste &amp; odor. Chemical tests- total solids, hardness, PH-value, chlorides, chlorine ,iron and manganese ,dissolve oxygen, fluoride ,nitrogen and its compounds .Biological tests- Total count of bacteria , E coli index , MPN,<br/>           1.3.4-Collection of water sample-procedure, precautions to Betaken.Standards for potable water as per IS.</p> | 14               | 17                        |

|  |   |           |           |
|--|---|-----------|-----------|
| <b>CEG505-2</b> Know the standards of purity of water, Understand water purification process and design, construction and maintenance aspects of treatment units.  |   |           |           |
| <b>2</b>   | <b>Water Purification –</b><br><br>2.1- <b>Screening</b> -Types of screens.<br>2.2- <b>Aeration</b> - Objects and methods of aeration.<br>2.3- <b>Sedimentation</b> - Plain sedimentation-Objects and Theory of plain sedimentation, Detention period, Types of sedimentation tank<br>2.4- <b>Sedimentation with coagulation</b> - Purpose, Principles of coagulation, Different chemicals used as coagulant, Advantages of alum, Feeding devices- wet feeding and dry feeding, Mixing devices, Clariflocculator. Jar test for optimum coagulant dose.<br>2.5- <b>Filtration</b> –Objects and Theory of filtration, Requirements of sand and gravel for filtration. Classification of filters-slow sand filters (only overview), rapid sand filters and pressure filters. Rapid sand filters(Gravity type)-filter media, base material ,its depth and grading, construction ,working and design aspects, Loss of head and negative head, Back washing process.<br>2.6- <b>Disinfection</b> – Objects of disinfection, Minor methods of disinfection. Chlorination- Properties of chlorine, Action of chlorine, application of chlorine . Different forms of chlorination, Break point chlorination, Residual chlorine and its importance. Tests for chlorine- Orthotolidin test, Starch–iodide-test.<br>2.7- <b>Advanced water treatments</b> –Electrolysis, Reverse Osmosis.<br>2.8- <b>Domestic appliances</b> - Working of water purifier, Working of R.O., Domestic plant, Softener, content of bottled mineral water (Questions not to set on these sub-topics). | <b>12</b> | <b>15</b> |
| <b>CEG505-3</b> Understand systems of conveyance and distribution of water and identify relevant types of valves.  |   |           |           |
| <b>3</b>   | <b>Conveyance and distribution of Water –</b><br>3.1-Conveyance- meaning, Different types of pipes used for conveyance of water.<br>3.2-Joints in CI and concrete pipes .Laying and testing of pipe line.<br>3.3-Valves- sluice valve, air relief valve, reflux valve, scour valve their functions, use and location on pipe line.<br>3.4-Distribution System - Zoning of area, methods of distribution-gravity, pumping and combined system (dual system). Methods of lay-out of distribution pipes- Dead end system ,Grid iron system , Circular system and radial system, their suitability , Merits and demerits<br>3.5-Service reservoirs- purpose and types-E.S.R, G.S.R.   | <b>06</b> | <b>08</b> |
|  | <b>Total</b>  | <b>32</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |   |           |           |

**Section II (Sanitary Engineering)**

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <p><b>CEG505-4</b>-Know the principles of sanitation and objects of sewage disposal, identify the sources of waste water, Draw labeled system of plumbing for building sanitation. Know the methods of collection and disposal of dry refuse (solid waste) in villages and towns.</p> |  |                  |                           |
| <p><b>4</b></p>   | <p><b>Building Sanitation and Solid Waste from Society-</b></p> <p><b>4.1- Building Sanitation-</b></p> <p>4.1.1-Necessity and principals of sanitation.</p> <p>4.1.2-Definitions of terms used-sewage, sullage, garbage, refuse, rubbish, night-soil, storm water, sanitary sewage, domestic sewage, bacteria etc .</p> <p>4.1.3Aims and objects of sewage disposal.</p> <p>4.1.4- Meaning, Principles of house drainage ,</p> <p>4.1.5- Definitions of terms related to building sanitation- Pipes - waste pipe, soil pipe, rain water pipe, vent pipe, Antisiphonage pipe.</p> <p>4.1.6- Building sanitary fitting- Traps –definition ,purpose, Requirements of good trap, Types- Nahni trap , Gully trap , Intercepting trap, P-Q-S trap, their functions use and location. water closets –Indian and European type , Urinals , Flushing cistern , Wash basins , sinks</p> <p>4.1.7- Plumbing system of drainage-Single stake system, One pipe system, One pipe system partially ventilated, Two pipe system. Choice of the system.</p> <p>4.1.8- Lay-out plan of house drainage system, Minimum size of drain and its slope, Inspection and Junction chambers their necessity ,location, size and shape. Testing of house drainage system and its maintenance .</p> <p><b>4.2-Solid Waste from society –</b></p> <p>4.2.1- Definitions-refuse, rubbish, dry refuse, garbage, Bacteria etc.common constituents of solid waste.</p> <p>4.2.2- Methods of collection of solid waste.</p> <p>4.2.3- Methods of treatment and disposal of solid waste.</p> <p>4.2.4- Hazardous Wastes; Introduction, meaning, Types of hazardous waste, characteristics, treatment and disposal.</p> | <p><b>10</b></p> | <p><b>17</b></p>          |
| <p><b>CEG505-5</b> Know the methods of carrying sewage and Understand design, construction and maintenance of water carriage system of sewerage.</p>  |  |                  |                           |



|   |   |           |           |
|---|---|-----------|-----------|
| 5   | <p><b>Collection, Conveyance of sewage and system of sewerages –</b><br/>           5.1-Methods of carrying refuse –conservancy system, water carriage system.<br/>           5.2-Conservancy system -meaning of term conservancy system, its advantages and disadvantages. Removal of night soil and disposal of excreta .<br/>           Septic tank – principles, working and design. soak pit and drains . Gobar gas plant – construction and operation<br/>           5.3-Water Carriage System –Meaning of term Water carriage system, its advantages and disadvantages.<br/>           5.4-Quantity of sewage – sources of sanitary sewage,factors affecting quantity of sewage.Dry-Weather flow , Wet- Weather flow, Systems of sewerage-Separate system, combined system, Partially separate system.<br/>           5.5-Design aspect of sewers – Minimum velocity (Self cleansing velocity),Maximum velocity (Non-scouring velocity). Size of sewer, Materials used for sewers. Laying and testing of sewers.<br/>           5.6-Sewer Appurtenances -Man-hole-types , purpose, location. Catch basins, Street Inlets .Ventilation of sewers.</p> | 11        | 11        |
| <b>CEG505-6 Understand analysis of sewage and Suggest waste water treatment.</b>  |   |           |           |
| 6   | <p><b>Characteristics and Treatment of Sewage-</b><br/> <b>6.1-Quality of Sewage-</b><br/>           6.1.1-Characteristics of sewage. Physical ,chemical and biological<br/>           6.1.2-BOD and its significance. Aerobic and anaerobic decomposition.<br/>           6.1.3-COD and its significance.<br/>           6.1.4-Maharashtra pollution control Board Norms for the discharge of treated sewage.<br/> <b>6.2-Sewage Treatment-</b><br/>           6.2.1-Object of sewage treatment. Degree of treatment Flow diagram of sewage treatment plant for a small town including primary and secondary treatment.<br/>           6.2.2-Primary treatment- meaning, Introduction and functions of screens, Grit chamber, Detritus tank, Skimming tank and Clarifier. Sludge digestion tank<br/>           6.2.3-Secondary treatment- meaning.<br/>           6.2.3.1-Trickling filters and its working.<br/>           6.2.3.2-Activated Sludge process-Flow diagram and its working only.<br/>           6.2.4-Disposal of sewage, Oxidation pond , Oxidation ditch.</p>   | 11        | 12        |
|   | <b>Total</b>  | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

**Specification table for setting question paper for semester end theory examination :**

| Topic No. | Name of topic   | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---|--|------------|-------------|----------------|-------------|
|           |   | Remember                                     | Understand | Application |                |             |
| 1         | Water sources, quantity and water analysis.               | 05   | 05         | 07          | CEG505-1       | 17          |
| 2         | Water Purification.                                       | 04   | 05         | 06          | CEG505-2       | 15          |
| 3         | Conveyance and distribution of Water.                     | 02   | 03         | 03          | CEG505-3       | 08          |
| 4         | Building Sanitation and Solid Waste from                  | 03   | 07         | 07          | CEG505-4       | 17          |
| 5         | Collection, Conveyance of sewage and system of sewerages. | 03   | 03         | 05          | CEG505-5       | 11          |
| 6         | Characteristics and Treatment of Sewage.                  | 03   | 03         | 06          | CEG505-6       | 12          |
|           | Total   | 20   | 26         | 34          | -----          | 80          |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure                    | Topic                            |
|----|-------------------------------------|----------------------------------|
| 1. | Field Visits                        | Every chapter of theory syllabus |
| 2. | Collecting data for assignment work | Exercise work assignment         |

**ASSESSMENT CRITERIA FOR PRACTICAL/EXERCISE WORK.**

**i) Continuous Assessment of practical/Exercise Work:**

Every practical assignment shall be assessed for 25 marks as per following criteria :

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted marks awarded in oral mark sheet as per *Assessment Pro-forma III*

## INSTRUCTIONAL STRATEGIES:

### Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .

### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for termend Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

### Teaching and Learning resources:

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

### REFERENCE MATERIAL :

#### Books / Journals / IS Codes / Website

#### a) Reference Books:

| Sr. No. | Author                     | Title                         | Publisher                     |
|---------|----------------------------|-------------------------------|-------------------------------|
| 1.      | G.S. Birdie & J. S. Birdie | Water supply & Sanitary Engg. | Dhanpat Rai & Sons, Delhi     |
| 2.      | S. C. Rangwala             | Water supply & Sanitary Engg. | AnandCharotar , Delhi         |
| 3.      | V.N. Gharpure              | Water supply Engg.            | Engg. Book Publishers co.Pune |
| 4.      | V.N. Gharpure              | Sanitary Engg.                | Engg. Book Publishers co.Pune |
| 5.      | Kamala A. & Katthrao D.L   | Environmental Engg.           | New York-Tata Mcgraw hill     |
| 6       | Gupta & Others             | Environmental Engg. System    | NiraliPrakashan Mumbai        |

**b) Recommended Further Readings:**

| <b>Sr. No.</b> | <b>Author</b>     | <b>Title</b>                  | <b>Publisher</b>               |
|----------------|-------------------|-------------------------------|--------------------------------|
| 1.             | Santosh Garg      | Water supply & Sanitary Engg. | Khanna Publishers, New Delhi   |
| 2.             | Hussain S. K.     | Water supply & Sanitary Engg. | New Delhi- Oxford & IBH        |
| 3.             | GurucharanShing   | Water supply & Sanitary Engg. | Std. Pub. Distributors , Delhi |
| 4.             | Steel E. N.       | Water supply & Sanitary Engg. |                                |
| 5.             | Fair Greyer & OKM | Water supply & Sanitary Engg. | London John Wiley              |

**c) Codes of Practice: IS, BIS and international codes:**

4. IS 14543: 2004 IS Code for testing of drinking water.
5. IS 8403: 1977 Code of practice disposal of Effluent from septic Tank.
6. Drinking water specifications (IS 10500: 1991)
7. BIS standard for effluent disposal printed in 1963, revised in 1968.
8. Code of practice for selection, installation & main water supply in building ---IS 2065

**d) Websites:**

1. <http://en.wikipedia.org/wiki/Bisleri>
2. [http://en.wikipedia.org/wiki/Aircraft\\_lavatory](http://en.wikipedia.org/wiki/Aircraft_lavatory)

**COURSE ID :**

**Course Name : IRRIGATION ENGINEERING**  
**Course Code : CEG506**  
**Course Abbreviation : GIRE**

**TEACHING AND EVALUATION SCHEME :**

**Pre-requisite Course(s) : <nil >**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 04           | 05      |
| Practical        | 02#          |         |

# practical alternate week

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                     |   | Term End Examination            |                     | Total |
|-----------------------|--|---|---------------------------------|---------------------|-------|
|                       | Theory   | Oral                                    | Theory Examination              | Oral**              |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | One Progressive Skill Tests of 25 marks | Term End Theory Exam (03 hours) | As per Proforma-III |       |
| Marks                 | 20   | 25                                      | 80                              | 25 E                | 125   |

\*\* Assessment of oral as per Pro-forma –III (To be assessed by internal and external examiner)

**RATIONALE :**

India is an agricultural country majority of people live in villages. Agriculture industry is the back bone of Indian economy. India being the tropical country, there is uncertain and inequitable rainfall and that to in 3 to 4 months of monsoon season. Therefore, every drop of water is required to be harnessed appropriately using the relevant technological tools and principles. Accordingly, Irrigation structures (dams, canals and allied structures) which basically are the backbone structures in the system used to reserve and conserve the water source. In the planning, design, construction, and maintenance of these structures, Civil engineers have a significant role to play. This course will enable the students to apply and use the basic principles and practices related to irrigation engineering at site for assured uniform supply of water throughout the year to increase the yield of the crops.

The input to the course is the knowledge of survey for investigation, hydrology for calculation of yield from rainfall records and hydraulics for designing the storage, conveyance and outlet structures.

**COMPETENCY**

Apply principles of Irrigation Engineering to solve engineering problems as follows.

**Cognitive:** Understanding and applying principles of Irrigation Engineering to engineering problems.

**Psychomotor :** i) Planning different types of Irrigation Projects ii) Calculate MFD iii) Water requirement of crops iv) Decide types of MI schemes for different situations v) Calculating storage capacity of reservoirs vi) Decide the types of dams and canal system for distribution of water

**Affective:** Attitude of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation  
viii) Hygiene vi) civic sense

### COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Programme Outcomes POs and PSOs   |  |                       |                                      |   |   |                         |                         |                      |                                   |                               |
|---|--|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| Competency and COs  | PO 1 Basic & Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & Testing | PO 5 Engineering practice for society, sustainability & environment | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
| <b>Competency:</b> Apply principles of Irrigation Engineering to solve engineering problems     | 3  | 3                     | 3                                    | 2   | 2   | 2                       | 2                       | 3                    | 3                                 | 2                             |
| <b>CEG506-1</b> Estimate hydrological parameters such as MFD and Yield                          | 3  | 3                     | 3                                    | 2   | 1   | 2                       | 2                       | 3                    | 1                                 | 2                             |
| <b>CEG506-2</b> Estimate water demand for various crops   | 3  | 3                     | 2                                    | 2   | 2   | 2                       | 2                       | 3                    | 3                                 | 2                             |
| <b>CEG506-3</b> Understand and decide the types of MI Schemes for different situations          | 3  | 3                     | 3                                    | 2   | 2   | 2                       | 2                       | 3                    | 3                                 | 2                             |
| <b>CEG506-4</b> Understand and analyses the storage capacity of reservoirs                      | 3  | 3                     | 3                                    | 2   | 2   | 1                       | 1                       | 3                    | 3                                 | 2                             |
| <b>CEG506-5</b> Understand and decide the types of dams and other structures at reservoir site. | 3  | 3                     | 3                                    | 2   | 2   | 2                       | 2                       | 3                    | 3                                 | 2                             |
| <b>CEG506-6</b> Understand the canal network and plan Canal system for distribution of water.   | 3  | 3                     | 3                                    | 2   | 2   | 2                       | 2                       | 3                    | 3                                 | 1                             |

**COURSE OUTCOMES:**

**CEG506-1** :- Estimate hydrological parameters such as MFD and Yield

**CEG506-2** :-Estimate water demand for command area

**CEG506-3** :-Understand and decide the types of MI Schemes for different situations

**CEG506-4**:- Understand and analyses the storage capacity of reservoirs

**CEG506-5** :- Understand and decide the types of dams and other structures at reservoir site.

**CEG506-6** :-Understand the canal network and plan Canal system for distribution of water.

**PRACTICALS/EXERCISES**

**Practical Exercises and related skills to be developed:**

The following practical exercises shall be conducted as practical sessions of batches of about 20 students:  
Practical work is divided in three parts as below

- 1) Field visits
- 2) Assignment work.
- 3) Experimental work.

| Sr No. | Title of Practical Exercise  | Skills / Competencies to be developed   | Course Outcome                  |
|--------|--|---|---------------------------------|
| 1      | <p><b>Field visits and data collection</b></p> <p>1.Existing irrigation projects<br/>2. Existing irrigation structures<br/>3.Student should collect current rainfall data for near by place and write the report on “Use of rainfall data<br/>4. To collect the discharge data of nearby river for a particular day.</p> | <p>1. Information collection and presentation in the form of report.</p> <p>2. Motivation through field exposure.</p>   | <p>CEG506-2</p> <p>CEG506-6</p> |
| 2      | <p><b>Sketches on Half imperial drawing sheets.</b></p> <p>1) Typical section of and earthen and gravity dam.</p> <p>1) Any two types of spillways.<br/>3) Section of canal in banking, in cutting and in partial cutting and partial banking</p>  | <p>1. Drawing and studying component parts of Earthen and Gravity Dams.</p> <p>2. Drawing and studying components of spillways.</p> <p>3.Drawing and studying component parts of various canal sections</p> | <p>CEG506-1</p> <p>CEG506-5</p> |

|   |  |   |  |
|---|--|---|--|
| 3 | <p><b>Suggested Micro-projects:</b></p> <p><b>Any one project for group of three to five students. Students should visit and prepare a miniproject report with drawings on the following irrigation works by visiting nearby structures ( Any Two)</b></p> <p>1) Lift irrigation scheme<br/>2) Percolation Tank<br/>3) K.T. weir<br/>4) Minor irrigation tank<br/>5) Earthen Dam.<br/>6) Masonary Dam<br/>7) Canal CD Works.<br/>8) Drip/ Sprinkler Irrigation</p> | <p>1. Information collection and presentation in the form of report.</p> <p>2. Motivation through field exposure.</p> <p>3. Developing self learning ability.</p> |  |
|---|--|---|--|

**CONTENT : THEORY**

**Section – I**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <p><b>Course Outcome- CEG506-1</b> :-understand the purposes and types of irrigation projects and Estimate hydrological parameters such as MFD and Yield</p> |  |                  |                           |
| 1  | <p><b>Introduction to irrigation and Hydrology</b></p> <p>1.1 Definition of irrigation and irrigation engg.<br/>1.2 Necessity and Importance of irrigation.<br/>1.3 Advantages and possible ill effect of irrigation projects.<br/>1.4 Types of Irrigation projects.<br/>1.5 Concept of hydrological cycle and Rainfall<br/>1.6 Rain Gauge: Symons raingauge, automatic rain gauge<br/>1.7 Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Thiessen polygon method. Factors affecting rainfall, characteristic of rainfall in India (emphasis on the rainfall in Maharashtra).<br/>1.8 Definition Run off, factors affecting runoff and various methods for run off calculation.<br/>1.9 Catchments – definition and types, yield and MFD<br/>Calculation of dependable yield for catchment, Maximum flood discharge &amp; methods of calculations.</p> | 09               | 10                        |
| <p><b>CEG506-2</b> :-Estimate water demand for command area and decide the suitable method of application of water at field</p>                              |  |                  |                           |



|  |  |           |           |
|--|--|-----------|-----------|
| <b>2</b>   | <p><b>Water Requirement For Crop</b></p> <p>2.1Crop seasons in Maharashtra. Crops in Maharashtra, definitions – crop period, base period, duty, delta, improvement of duty.</p> <p>2.2Estimating water demand for given cropping pattern, crop rotation</p> <p>2.3Definitions – CCA, GCA, IA, intensity of irrigation, time factor</p> <p>2.4Methods of application of water - Surface, subsurface methods, Sprinkler, drip irrigation method</p>  | <b>09</b> | <b>10</b> |
| <b>CEG506-3 :-Understand and decide the types of MI Schemes for different situations</b>   |  |           |           |
| <b>3</b>   | <p><b>Minor Irrigation Schemes</b></p> <p>3.1Bandhara irrigation - Lay out of Typical Bandhara irrigation scheme, advantages, disadvantage, selection of site, design principles</p> <p>3.2Percolation tanks : Necessity and Importance, selection of site, component parts &amp; construction</p> <p>3.3K.T. Weir - components, construction</p> <p>3.4Lift Irrigation : Suitability of this type of irrigation, Component parts, function and broad design principles, advantages and disadvantages</p> <p>3.5Well Irrigation - Advantages and disadvantages and limitations of well irrigation. open and tube wells, methods of determining, yield of wells</p> | <b>14</b> | <b>20</b> |
|  | <b>Total</b>   | <b>32</b> | <b>40</b> |
| <p>(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.)</p> |  |           |           |

**Section II**

| Sr. No.  | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|--|--|------------------|---------------------------|
| <b>CEG506-4:-</b> Understand and analyses the storage capacity of reservoirs                       |  |                  |                           |
| 4  | <p><b>Reservoir Planning</b></p> <p>4.1 Capacity of Reservoir, Use of area capacity curves in fixing up the storage's.</p> <p>4.2 Height of dam, dead storage, live storage, Reservoir Losses sedimentation, Flood absorption capacity, Free Board , Gross storage Simple problems on fixing control levels.</p>   | 06               | 08                        |
| <b>CEG506-5 :-</b> Understand and decide the types of dams and other structures at reservoir site. |  |                  |                           |
| 5  | <p><b>Dams</b></p> <p>5.1 Types of Dams, Gravity &amp; Earthen dams</p> <p>5.2 Gravity Dams - components and their function, theoretical &amp; Practical profiles, construction details, joints and galleries</p> <p>5.3 Earthen Dams - Components of earthen dam &amp; their functions, Typical c/s of an earthen dam, construction materials used. Seepage through earthen dam &amp; controlling methods, construction procedure of earthen dam</p> <p>5.3 Spillways, definition and Purpose , type of spillways with &amp; without gates, conditions favoring each type. Spillway gates - Radial, rectangular gates</p> <p>5.5 Outlet through Dams - Function and Component parts</p> <p>Energy Dissipation - Concept and methods of energy dissipation</p> | 16               | 20                        |

| <b>CEG506-6 :-Understand the canal network and plan Canal system for distribution of water.</b>   |  |           |           |
|---|--|-----------|-----------|
| <b>6</b>  | <b>Canals And Distribution Systems</b>   | <b>10</b> | <b>12</b> |
|   | 6.1 Canals -Classification based on alignments & its position in the network, typical canal sections , capacity of canal , time factor |           |           |
|   | 6.2 Canal cross drainage work - C.D. works, such as aqueduct , siphons, super passage, level crossing                                  |           |           |
|   | 6.3 Canal out lets - Different types of canal outlets  |           |           |
|   | 6.4 Canal Lining - Purpose & common materials used for canal lining  |           |           |
|   | 6.5 Water logging & salt efflorescence's - causes and effect, preventive and remedial measures   |           |           |
|   | <b>Total</b>   | <b>32</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                   | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|---------------------------------|--|------------|-------------|----------------|-------------|
|           |                                 | Remember                                     | Understand | Application |                |             |
| 1         | Introduction and hydrology      | 04   | 04         | 02          | CEG506-1       | <b>10</b>   |
| 2         | Water Requirement For Crop      | 02   | 04         | 04          | CEG506-2       | <b>10</b>   |
| 3         | Minor Irrigation Schemes        | 06   | 06         | 08          | CEG506-3       | <b>20</b>   |
| 4         | Reservoir Planning              | 02   | 02         | 04          | CEG506-4       | <b>08</b>   |
| 5         | Dams                            | 04   | 08         | 08          | CEG506-5       | <b>20</b>   |
| 6         | Canals And Distribution Systems | 04   | 04         | 04          | CEG506-6       | <b>12</b>   |
|           |                                 | <b>22</b>                                    | <b>28</b>  | <b>30</b>   |                | <b>80</b>   |

(Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

### INDUSTRIAL EXPOSURE:

| SN | Mode of Exposure                    | Topic                            |
|----|-------------------------------------|----------------------------------|
| 1. | Field Visits                        | Every chapter of theory syllabus |
| 2. | Collecting data for assignment work | Exercise work assignment         |

### ASSESSMENT CRITERIA FOR PRACTICAL/EXERCISE WORK.

#### i) Continuous Assessment of practical/Exercise Work:

Every practical assignment shall be assessed for 25 marks as per following criteria :

| Domain       | Particulars                | Marks out of 25 |
|--------------|----------------------------|-----------------|
| Cognitive    | Understanding              | 02              |
|              | Application                | 03              |
| Psychomotor  | Operating Skills           | 05              |
|              | Drawing / drafting skills  | 05              |
| Affective    | Discipline and punctuality | 05              |
|              | Decency and presentation   | 05              |
| <b>TOTAL</b> |                            | <b>25</b>       |

#### ii) Progressive Skill Test:

One mid-term *Progressive Skill Test* of 25 marks shall be conducted marks awarded in oral mark sheet as per *Assessment Pro-forma I*.

### INSTRUCTIONAL STRATEGIES :

#### Instructional Methods :

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

#### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no. of students in the group should not exceed five. For assessment of Micro-project 20% of marks allotted for term end Practical/Oral examination should be considered and should be entered in relevant pro-forma.

A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL :**

**Books / Journals / IS Codes / Websites**

**a)Reference Books:**

| Sr. No. | Author           | Title  | Publisher                             |
|---------|------------------|--|---------------------------------------|
| 1.      | S. K. Garg       | Irrigation Engineering                       | Khanna publishers, New Delhi          |
| 2.      | B. C. Punamia    | Irrigation Engineering and water power engg. | Standard publishers and distri, Delhi |
| 3.      | J. G.Dahigaonkar | Irrigation Engineering                       | Wheeler publishing, Allahabad         |
| 4.      | V. S. Gajare     | Text book of irrigation engg.                | Nirali prakashan, Pune 2              |
| 5.      | PriyaniV.B.      | Irrigation Engineering                       | CharotarBookStall,Anand               |

**b) Recommended Further Readings:**

| Sr. No. | Author                     | Title                                     | Publisher                                     |
|---------|----------------------------|---|---|
| 1.      | Basak,N.N.                 | Irrigation Engineering                    | McGraw Hill Education India Pvt. Ltd.NewDelhi |
| 2.      | Asawa,G.L.                 | Irrigation and water resource Engineering | New Age International (P) Limited Publishers. |
| 3.      | Sharma,R.K.and Sharma,T.K. | Irrigation Engineering                    | S.Chandand CompanyLtd.Delhi                   |

**IS, BIS and International Codes:**

1. IS: 4410-Part-V-1982-Canals
2. IS: 4410-Part-VI-1983-Reservoirs.  
Part- VII-1968-Dams.  
Part-XVII-1977-Water Requirement of Crops
3. IS: 5477-Part-II, III and IV -1969-71-Storage zones of reservoirs.

**SOFTWARE/LEARNING WEBSITES/LEARNING RESOURCES**

- a. <http://nptel.ac.in/courses/105105110/>
- b. <https://wrd.maharashtra.gov.in>
- c. <http://www.imd.gov.in>
- d. <http://www.mahahp.gov.in>
- e. [http://bhuvan.nrsc.gov.in/bhuvan links.php](http://bhuvan.nrsc.gov.in/bhuvan%20links.php)
- f. Charts/Models/Drawings

\* \* \*

**COURSE ID :**

**Course Name** : EARTHQUAKE ENGINEERING (Elective-3)  
**Course Code** : CEG507  
**Course Abbreviation** : GEQE

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s)** : -- Nil --

**Teaching Scheme :**

| Scheme Component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 03      |
| Practical        | --           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assessment                |           | Term End Examination<br>Theory | Total |
|-----------------------|---------------------------------------|-----------|--------------------------------|-------|
|                       | Theory                                | Practical |                                |       |
| Details of Evaluation | Average of two tests of 20 marks each | --        | Examination (03 hours)         |       |
| Marks                 | 20                                    | --        | 80                             | 100   |

**RATIONALE :**

Earthquakes are one of the most destructive forces that nature unleashes on earth. They not only cause loss of life & property but also shakes the moral of people. Devastation due to recent earthquakes viz. Khillari (Maharashtra) 1993, Bhuj (Gujrat) 2001 etc are the eye opener not only to the Engineering faculty but also to the Architects, Builders & related agencies. Since the earthquakes are so unpredictable and unpreventable, the only course open to us is to design and build the structures in such way that they will sustain the seismic shocks and minimizes loss of life and property.

**COMPETENCY :**

Apply principles of earthquake engineering to civil engineering structures as follows :

**Cognitive** :Understanding and applying principles of earthquake engineering

**Psychomotor** :i) Calculating skills ii) drafting skills

**Affective** :Attitude of i) precision ii) accuracy iii) safety iv) punctuality

**COURSE OUTCOMES :**

**CEG507-1** Explain basic concepts of seismology.

**CEG507-2** Explain concepts of theory of vibrations.

**CEG507-3** Explain response spectrum theory.

**CEG507-4** Explain principles of earthquake resistant design

**CEG507-5** Explain and apply IS provisions of ductile detailing.

**CEG507-6** Explain construction aspects of earthquake resistant structures.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX :**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

| Programme Outcomes POs and PSOs  |   |                       |                                      |   |   |                         |                         |                      |                                   |                               |
|--|---|-----------------------|--------------------------------------|---|---|-------------------------|-------------------------|----------------------|-----------------------------------|-------------------------------|
| Competency and COs   | PO 1 Basic& Discipline specific knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Engineering Tools, Experimentation & | PO5 Engineering practice for society, sustainability & environmen | PO 6 Project management | PO 7 Life-long learning | PSO1 Plan and Design | PSO2 Construction and Maintenance | PSO3 Problem Solving on field |
| <b>Competency:</b><br>Apply principles of earthquake engineering to civil engineering structures | 3   | 3                     | 2                                    | 1   | 1   | 1                       | 2                       | 3                    | 2                                 | 3                             |
| <b>CEG507-1</b><br>Explain basic concepts of   | 3   | 3                     | 2                                    | 1   | 2   | 1                       | 2                       | 3                    | 2                                 | 3                             |
| <b>CEG507-2</b><br>Explain   | 3   | 3                     | 2                                    | 1   | 1   | 2                       | 2                       | 3                    | 2                                 | 2                             |
| <b>CEG507-3</b><br>Explain   | 3   | 3                     | 2                                    | 1   | 2   | 1                       | 2                       | 3                    | 2                                 | 2                             |
| <b>CEG507-4</b><br>Explain principles  | 3   | 3                     | 2                                    | 2   | 1   | 2                       | 2                       | 3                    | 2                                 | 3                             |
| <b>CEG507-5</b><br>Explain and apply IS provisions of ductile detailing                          | 3   | 3                     | 2                                    | 1   | 2   | 1                       | 2                       | 3                    | 2                                 | 3                             |
| <b>CEG507-6</b><br>Explain construction aspects of earthquake resistant structures               | 3   | 3                     | 2                                    | 1   | 1   | 3                       | 2                       | 3                    | 2                                 | 3                             |



**CONTENTS :A) THOERY**

**Section I**

| Sr. No.   | Topics   | Teaching (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>Course outcome: CEG507-1-Explain basic concepts of seismology.</b>     |  |                  |                           |
| 1.  | <b>Introduction to seismology-</b><br>1.1 structure of earth: Barysphere, Asthenosphere and Lithosphere<br>1.2 Tectonic plates, movement of tectonic plates, zones of divergence, zones of convergence and fracture zones<br>1.3 Geometric notation for description of earthquake, definition of focus, epicenter, epicentral distance, hypocentral distance<br>1.4 Classification of Seismic waves : P-waves, S-waves, L-waves and Raleigh waves, properties of these waves<br>1.5 Magnitude and intensity of earthquake : definition and comparison, details and MSK scale as per 1893-2002<br>1.6 Classification of earthquake according to location, focal depth, origin and magnitude<br>1.7 Earthquake energy released according to magnitude<br>1.8 Seismograph Causes of earthquake, ill-effects of earthquake and Tsunami | 10               | 16                        |
| <b>Course Outcome: CEG507-2-Explain concepts of theory of vibrations.</b> |  |                  |                           |
| 2   | <b>Theory of vibrations-</b><br>2.1 Oscillations of flexible buildings, fundamental natural periods of structures.<br>2.2 Different governing equation of a vibrating system (only names)<br>2.3 Damping : Types of damping, damping ratios for building materials and structures<br>2.4 Definitions of free vibration, forced vibration, damped vibration, resonance, DOF and SDOF<br>2.5 Mathematical modeling and equation of motion.   | 06               | 10                        |
| <b>Course Outcome : CEG508-3-Explain response spectrum theory.</b>        |  |                  |                           |
| 3   | <b>Response spectrum theory-</b><br>3.1 Ground motion, strong ground accelograph, typical ground acceleration record<br>3.2 Important properties affecting structures : Duration, PGA, frequency content, response spectrum, equations of response Spectrum and combined spectrum.<br>3.3 Details of IS 1893-2016 : Terminology : Seismic zones, importance factor I, response reduction factor R, Seismic mass, seismic weight, seismic factors, ZPA, soft storey and weak storey<br>3.4 Assumptions made in earthquake design of structures<br>3.5 Load combination for earthquake design<br>3.6 Formula for determining design lateral force  | 08               | 14                        |
| <b>Total</b>  |  | <b>24</b>        | <b>40</b>                 |

| Sr. No.   | Topics | Teaching (Hours) | Theory Evaluation (Marks) |
|---|--------|------------------|---------------------------|
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks |        |                  |                           |

### Section II

| Sr. no.   | Topics  | Teaching (Hours) | Theory evaluation Marks |
|---|---|------------------|-------------------------|
| <b>Course Outcome : CEG507-4</b> Explain principles of earthquake resistant design.             |   |                  |                         |
| <b>4</b>  | <b>Earthquake resistant design-</b><br>4.1 Seismic effects on structures, flow of seismic inertia forces through all structural components of a building, design horizontal force, seismic mass<br>4.2 Definitions of terms : configuration, aspect ratio, slenderness ratio<br>4.3 Lateral load resisting systems: bearing wall system, moment resisting systems, dual systems and tube systems.<br>4.4 Configuration requirements form the planner's point of view<br>4.5 Making a structure uniform and continuous distribution of strength from the designer's point of view<br>4.6 Basic principles and guidelines for achieving earthquake resistant structural design  | <b>10</b>        | <b>16</b>               |
| <b>Course Outcome : CEG507-5</b> Explain and apply IS provisions of ductile detailing           |   |                  |                         |
| <b>5</b>  | <b>Ductile detailing of R.C.C. structures subjected to seismic forces as per is 13920-2016-</b><br>5.1 Principles of earthquake design of RCC members: ductile failure, weak-beam strong column design and failure of joints.<br>5.2 Definition of terms : cross tie, ductility, hoop, shear wall and space frame<br>5.3 General specification for grade of concrete and steel.<br>Flexural members<br>5.4 Beams : general requirements, longitudinal reinforcement, anchorage of beam bars in an external joints, lap splice in beams, beam web reinforcement<br>5.5 Columns : general requirement, longitudinal reinforcement, transverse reinforcement, column and joint detailing<br>5.6 Footings : special confining reinforcement in footings<br>Shear walls : general requirements | <b>08</b>        | <b>12</b>               |
| <b>Course Outcome: CEG507-6</b> Explain construction aspects of earthquake resistant structures |   |                  |                         |
| <b>6</b>  | <b>Construction aspects of earthquake resistant structures-</b><br>6.1 Design considerations in providing ductile detailing<br>6.2 Formation of plastic hinges in beams rather than columns<br>6.3 Comparison between flexible structures and stiff structures<br>6.4 Desirable properties of construction materials for earthquake resistant structures.   | <b>06</b>        | <b>12</b>               |

|   |           |           |
|---|-----------|-----------|
| 6.5 Salient features of earthquake resistant provisions recommended in IS : 4326 and IS 13928 for the following<br>General principle, masonry units, mortar, wall dimensions, number of storeys, masonry bond, openings, seismic strengthening arrangements |           |           |
| 6.6 Causes of damage in masonry building due to earthquake  |           |           |
| 6.7 Strengthening of masonry wall construction  |           |           |
| <b>Total</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above. Candidate can attempt questions for the above allotted marks   |           |           |

**Specification table for setting question paper for semester end theory examination.**

| Topic No. | Name of Topic                                     | Distribution of Marks (Cognitive level wise) |            |           | Total Marks |
|-----------|---|--|------------|-----------|-------------|
|           |   | Remember                                     | Understand | Apply     |             |
| 1         | Introduction to seismology                        | 02   | 04         | 10        | 16          |
| 2         | Flexural Analysis and Design of Rectangular Beams | 02   | 04         | 04        | 10          |
| 3         | Flexural Analysis and Design of Flanged Beams     | 02   | 02         | 10        | 14          |
| 4         | Shear, Bond and Torsion                           | 02   | 04         | 10        | 16          |
| 5         | Design of Slabs                                   | 02   | 04         | 06        | 12          |
| 6         | Design of Columns and Footings                    | 02   | 04         | 06        | 12          |
|           | Total   | <b>12</b>                                    | <b>22</b>  | <b>46</b> | <b>80</b>   |

**B) INDUSTRIAL EXPOSURE**

| SN | Mode of Exposure                     | Topic                     |
|----|--------------------------------------|---------------------------|
| 1. | Field examples of course application | Topics of theory syllabus |

**IMPLEMENTATION STRATEGY :**

**Instructional strategies:**

- 2.1 Lectures and discussions
- 2.2 Time bound regular home assignments
- 2.3 Industrial visits
- 2.4 Case study
- 2.5 Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
- 2.6 About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*

**Teaching and Learning Resources:**

1. Chalk-board
2. Models and Magnetic cut-outs
3. Demonstrative charts
4. Computer aided presentations

**REFERENCE MATERIAL :**

**g) Books / Journals / IS Codes**

| <b>Sr. No.</b> | <b>Author</b>                       | <b>Title</b>                                   | <b>Publisher</b>                |
|----------------|-------------------------------------|--|---------------------------------|
| 1.             | Pankaj Agrawal<br>Manish Shrikhande | Earthquake Resistant Design of Structures      | PHI Learning Pvt.Ltd.           |
| 2.             | David J. Dowrick                    | Earthquake Resistant Design                    | Wiley India Pvt.Ltd., New Delhi |
| 3.             | C.V.R.Murty                         | Earthquake Tips                                | IITR – B BM TPC                 |
| 4.             | Jai Krishna<br>A.R.Chandrasekran    | Elements of Earthquake Engineering             | South Asian Publications        |
| 5.             | P. C.Varghase                       | Advanced RCC Design                            | Prentice Hall of India,         |
| 6.             | S.U.Pillai<br>Devdas Menon          | Reinforced Concrete Design                     | Tata McGraw Hill,<br>Mumbai     |
| 7.             | David Dowrick                       | Earthquake Resistant Design and Risk Reduction | Wiley India Pvt.Ltd., New Delhi |
| 8.             | Steven L. Kramer                    | Geotechnical Earthquake Engineering            | Pearson Education               |

**h) I.S. Codes:**

1. IS 13920-2016 Ductile Detailing of R. C. Building subjected to Seismic forces
2. IS 4326
3. IS 13928
4. IS 1893-2016

\* \* \*

**COURSE ID:**

**Course Name** : **Industrial Waste Management**  
**Course Code** : **CEG508**  
**Course Abbreviation** : **GIWM**

**TEACHING AND EVALUATION SCHEME**

**Pre-requisite Course(s)** : *Nil*

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 3            | 3       |
| Practical        | --           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                                       |           | Term End Examination |      | Total      |
|-----------------------|--|-----------|----------------------|------|------------|
|                       | Theory   | Practical | Theory               | Oral |            |
| Details of Evaluation | Average of Two tests of 20 marks each (1 hour duration each) |           | One paper (3 hours)  |      |            |
| Marks                 | 20   | --        | 80                   | --   | <b>100</b> |

**Rationale:**

Industrialization is increasing day by day. Huge quantity of industrial waste is become a serious problem to environment. Industrial waste is offensive causing nuisance, odour and danger to public health. Pollution of water, destruction of aquatic life, soil pollution, etc is caused. Therefore the study becomes essential to know the problem of industrial waste. Its effective management will enable to maintain good environment.

**COMPETENCY**

Applying knowledge of effective management to maintain good environment

**Cognitive:** Understanding and applying knowledge of Industrial Waste Management.

**Psychomotor:** Conducting site visit to treatment plant.

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

**Course Outcomes:**

**CEF508 -1** Decide the standards for disposal of industrial effluent

**CEF508 -2** Decide the methods of treatment on Industrial Waste

**CEF508 -3** Describe the methods of disposal & reuse of water

**CEF508- 4** Decide the treatment given to different types of industrial waste

**CEF508- 5** Selection of advanced treatments on industrial waste

**CEF508-6** Explain the concept of Common effluent treatment plant

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”: no correlation]

| Competency and COs   | Programme Outcomes POs and PSOs               |                          |   |  |  |                            |                            |                         |                                      |                                  |
|--|---|--------------------------|---|--|--|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
|  | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency: Applying knowledge of Effective management to maintain good environment</b> | 3   | 3                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 1                                |
| <i>CEF508 -1 Decide the standards for disposal of industrial effluent.</i>                 | 3   | 3                        | 2                                       | 2  | 3  | 3                          | 1                          | 2                       | 2                                    | 1                                |
| <i>CEF508 -2 Decide the methods of treatment on Industrial Waste.</i>                      | 2   | 3                        | 3                                       | 1  | 1  | 2                          | 2                          | 3                       | 3                                    | 1                                |
| <i>CEF508 -3 Describe the methods of disposal &amp; reuse of water.</i>                    | 3   | 3                        | 2                                       | 2  | 3  | 2                          | 3                          | 2                       | 3                                    | 1                                |
| <i>CEF508 -4 Decide the treatment given to different types of industrial waste.</i>        | 3   | 2                        | 2                                       | 2  | 2  | 2                          | 2                          | 3                       | 3                                    | 1                                |
| <i>CEF508- 5 Selection of advanced treatments on industrial waste.</i>                     | 3   | 3                        | 2                                       | 1  | 3  | 2                          | 3                          | 2                       | 2                                    | 1                                |
| <i>CEF508 -6 Explain the concept of Common effluent treatment plant.</i>                   | 3   | 2                        | 1                                       | 1  | 2  | 2                          | 2                          | 2                       | 2                                    | 1                                |

**CONTENT: THEORY**

**Section I**

| Sr. no.   | Topics  | Teaching (Hours) | Theory evaluation Marks |
|---|---|------------------|-------------------------|
| <i>Course Outcome CEF508 -1 Decide the standards for disposal of industrial effluent.</i>   |   |                  |                         |
| <b>1</b>  | <b>Introduction</b><br>1.1 Brief introduction of course.<br>1.2 Importance<br>1.3 Industrial waste characteristics (general)<br>1.4 Industrial effluent standards for disposal into streams.<br>1.5 Industrial effluent standards for disposal on land.   | <b>04</b>        | <b>08</b>               |
| <i>Course Outcome CEF508 -2 Decide the methods of treatment on Industrial Waste.</i>  |   |                  |                         |
| <b>2</b>  | <b>Treatment methods</b><br>2.1 Primary treatments:<br>2.1.1. Screening-purpose and types,<br>2.1.2 Settling tanks- purpose and types<br>2.1.3 Floation-purpose and types<br>2.1.4 Neutralisation, proportioning, equalisation- Purpose and methods<br>2.2 Secondary treatments:<br>2.2.1. Coagulation, flocculation and adsorption purpose and methods.<br>2.2.2. Ion exchange, Dialysis, evaporation and reverse osmosis, Precipitation- purpose and methods<br>2.2.3. Biological treatments –Lagooning, activated sludge, trickling filtration, anaerobic digestion- purpose and brief description of each .<br>2.3 Final treatments: Treatment and disposal of sludge solids. Digestion, vacuum filtration, Lagooning, incineration centrifuging ,land filling- purpose of each and brief description | <b>14</b>        | <b>24</b>               |
| <i>Course Outcome CEF508 -3 Describe the methods of disposal &amp; reuse of water.</i>  |   |                  |                         |
| <b>3</b>  | <b>Waste water disposal and reuse:</b><br><b>3.1 Disposal</b><br>3.1.1 Introduction<br>3.1.2 Use for Irrigation<br>3.1.3 Rapid infiltration<br><br><b>3.2 Reuse</b><br>3.2.1 Recreational facilities<br>3.2.2 Industrial water supply<br>3.2.3 Ground water recharge  | <b>06</b>        | <b>08</b>               |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                         |

**Section II**

| Sr. no.   | Topics  | Teaching (Hours) | Theory evaluation Marks |
|---|---|------------------|-------------------------|
| <b>Course Outcome CEF508 -4 Decide the treatment given to different types of industrial waste.</b>  |   |                  |                         |
| <b>4</b>  | <b>Waste management</b><br>Characteristics, treatment of the wastes with flow chart for following industrial wastes :<br>4.1 Sugar industry.<br>4.2 Pulp and paper industry.<br>4.3 Dairy industry.<br>4.4 Textile industry.<br>4.5 Tannery industry.<br>4.6 Distillery industry.<br>4.7 Fertilizer industry. | <b>12</b>        | <b>20</b>               |
| <b>Course Outcome CEF508- 5 Selection of advanced treatments on industrial waste.</b>   |   |                  |                         |
| <b>5</b>  | <b>Advanced waste treatments:(only brief idea of following)</b><br>5.1 Removal of colour and refractory organics-<br>Chemical oxidation.<br>5.2 Removal of metals -Precipitation<br>5.3 Radioactive waste disposal.   | <b>05</b>        | <b>08</b>               |
| <b>Course Outcome CEF508 -6 Explain the concept of Common effluent treatment plant.</b>   |   |                  |                         |
| <b>6</b>  | <b>Common effluent treatment plant:</b><br>6.1 Concept and benefits of CETP.<br>6.2 Points to be observed for implementing CETP.<br>6.3 CETP for textile industrial sectors.  | <b>07</b>        | <b>12</b>               |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                         |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                   | Distribution of marks (Cognitive level-wise) |            |              | Course Outcome | Total Marks |
|-----------|---------------------------------|--|------------|--------------|----------------|-------------|
|           |                                 | Remember                                     | Understand | Applica-tion |                |             |
| 1         | Introduction                    | 04   | 02         | 02           | CCG508-1       | 08          |
| 2         | Treatment method                | 08   | 08         | 08           | CCG508-2       | 24          |
| 3         | Waste water disposal and reuse  | 02   | 02         | 04           | CCG508-3       | 08          |
| 4         | Waste management                | 04   | 08         | 08           | CCG508-4       | 20          |
| 5         | Advanced waste treatment        | 02   | 02         | 04           | CCG508-5       | 08          |
| 6         | Common effluent treatment plant | 04   | 04         | 04           | CCG508-6       | 12          |
|           | TOTAL                           | 24   | 26         | 30           |                | 80          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.



**INDUSTRIAL EXPOSURE:**

| SrNo. | Mode of Exposure                     | Topic                            |
|-------|--------------------------------------|----------------------------------|
| 1.    | Field examples of course application | Every chapter of theory syllabus |

**INSTRUCTIONAL STRATEGIES:**

**Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning* .

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL:**

**a) Books / Journals / IS Codes**

| Sr. No. | Author          | Title                                       | Publisher                              |
|---------|-----------------|---|--|
| 1.      | Soli J Arcivala | Waste water treatment for pollution control | Tata McGraw Hill                       |
| 2.      | Peavy, Row      | Environmental Engg                          | Tata McGraw Hill                       |
| 3.      | Fair and Geyer  | Water and waste water engg                  | John Willey and Sons, New York, London |
| 4.      | G. S. Birdi     | Water supply and sanitary engg.             | Standard Book House                    |
| 5.      | S. K. Garg      | Sewage disposal and air pollution engg.     | Khanna publishers, Delhi               |
| 6.      | Metalcalf Eddy  | Waste water engg                            | Tata McGraw Hill                       |

**COURSE ID :**

**Course Name : SOLID WASTE MANAGEMENT (Elective-3)**  
**Course Code : CEG 509**  
**Course Abbreviation : GSWM**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : NIL**

**Teaching Scheme :**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 03           | 03      |
| Practical        | --           |         |

**Evaluation Scheme :**

| Mode of Evaluation    | Progressive Assement                                       |           | Term End Examination |      | Total |
|-----------------------|--|-----------|----------------------|------|-------|
|                       | Theory   | Practical | Theory               | Oral |       |
| Details of Evaluation | Average of Two tests of 20marks each(1 hour duration each) | ---       | One paper (3 hours)  | ---  |       |
| Marks                 | 20   | ---       | 80                   | ---  | 100   |

**RATIONALE :**

The problem of solid waste is spread all over the country, within the urban as well as rural area. That's why its management at national level is today prime need to keep the environment safe and clean. Solid waste management include the activities related to generation of refuse, its storage, Collection, transportation, processing, recycling, reuse, recovery and disposal in an environmentally acceptable manner. The responsibility lies not only on local bodies, government but also on all the citizens. This is elective subject and intended to teach the students; the activities related to generation of waste storage, collection, transportation, processing, reuse, recovery, recycling and disposal in economic and environmentally acceptable manner.

**COMPETENCY**

Apply principles collection, handling and disposing of the solid waste.

**Cognitive :** Understanding the art of collection and transporting the solid waste.

**Psychomotor:** i) Designing the disposal methods ii) Fixing the capacity of transporting equipments iii) Designing sorting equipments.

**Affective:** Attitude of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation v) hygiene vi) civic sense

**COURSE OUTCOMES :**

**CEG509-1**-Identify the different sources, types and characteristics of solid wastes.

**CEG509-2**-Execute the collection techniques and transporting of solid waste.

**CEG509-3**-Execute relevant method for biomedical waste disposal and awareness about health aspects in solid waste management.

**CEG509-4**-Implement sanitary land filling and composting method of disposal.

**CEG509-5**- Implement Incineration method of disposal and industrial waste disposal.

**CEG509-6**-Implement the relevant laws related to solid waste management.

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-” : no correlation ]

**CONTENT : THEORY**

| Programme Outcomes POs and PSOs  |   |                          |   |  |   |                            |                            |                         |                                      |                                  |
|--|---|--------------------------|---|--|---|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
| Competency and COs   | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| <b>Competency:</b> Apply principles of Solid Waste Management to solve engineering problems.   | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG509-1</b> -Identify the different sources, types and characteristics of solid wastes.  | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG509-2</b> - Execute the collection techniques and transporting of solid waste.   | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG509-3</b> -Execute relevant method for Biomedical waste disposal and awareness about health aspects in solid waste management. | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG509-4</b> -Implement sanitary land filling and composting method of disposal.  | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG509-5</b> -Implement Incineration method of disposal and industrial waste disposal.  | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <b>CEG509-6</b> -Implement the relevant laws related to solid waste management.  | 3   | 2                        | 2                                       | 2  | 3   | 2                          | 2                          | 3                       | 3                                    | 2                                |

Section – I

| Sr. No.   | Topics / Sub-topics  | Lectures (Hours) | Theory Evaluation (Marks) |
|---|--|------------------|---------------------------|
| <b>Course Outcome- CEG509-1-Identify the different sources, types and characteristics of solid wastes</b> |  |                  |                           |
| 1   | <p><b>Fundamentals of Solid Waste-</b></p> <p>1.1-Definitions of solid waste</p> <p>1.2-Classification of solid waste- Domestic waste, Commercial waste, Institutional waste, Industrial waste, Construction waste, agriculture waste, biomedical waste, Hazardous waste, Non-hazardous waste, Toxic waste, street sweepings,E -waste</p> <p>1.3 Sources of solid waste</p> <p>1.4 Composition of solid waste</p> <p>1.5</p> <p>1.5-Quantities of solid waste generated, sample figure for some cities in India as well as outside India</p> <p>1.6-Factors affecting on solid waste generation .</p> <p>1.7-Physical and chemical characteristics.</p> <p>1.8-Solid waste management hierarchy.</p>   | 06               | 10                        |
| <b>Course Outcome- CEG509-2- Execute the collection techniques and transporting of solid waste.</b>       |  |                  |                           |
| 2   | <p><b>Storage, Collection and Transportation of Municipal Solid Waste-</b></p> <p>2.1- Storage of Municipal Solid Waste.</p> <p>2.2- Collection of Municipal Solid Waste.</p> <p>2.3- Tools and Equipments-Litter bin ,Broom,Shovels ,Hand carts, Mechanical road sweepers, Community bins like movable and stationary.</p> <p>2.4- Transportation of Municipal Waste.</p> <p>2.4.1-Transportation vehicles with their capacity and working-Animal carts, Auto vehicles ,Tractors or Trailers, Trucks, Dumpers, Compactor vehicles.</p> <p>2.4.2-Transfer stations: meaning, necessity, location.</p> <p>2.5- Organization pattern of solid waste management.</p> <p>2.6- Recycling of Municipal Waste, reuse and Resource Recovery,Segregation and salvage recovery,Use of solid waste as raw material in industry.</p> | 09               | 14                        |

|  |   |           |           |
|--|---|-----------|-----------|
| <b>Course Outcome-CEG509-3-Execute relevant method for Biomedical waste disposal and awareness about health aspects in solid waste management.</b>   |   |           |           |
| <b>3</b>   | <p><b>Biomedical waste, health aspects and Public involment in Solid waste Management.</b></p> <p><b>3.1- Biomedical/Hospital Waste-</b><br/>           3.1.1-Definition of Biomedical waste.<br/>           3.1.2-Sources of generation of Biomedical waste.<br/>           3.1.3-Types of hospital waste-clinical and non clinical.<br/>           3.1.4- Storage of hospital waste<br/>           3.1.5- Collection of hospital waste<br/>           3.1.6- Transportation of hospital waste<br/>           3.1.7-Disposal of hospital waste- Incinration</p> <p><b>3.2-Health Aspects and public involvement In Solid Waste Management-</b><br/>           3.2.1- Health aspect and during solid waste handling and processing.<br/>           3.2.2- Health problems arising at the time of segregation, reuse, Recovery recycling and at final disposal sites.<br/>           3.2.3- Handling and disposal of hazardous waste.<br/>           3.2.4-Public involvement and participation in solid waste Management.</p> | <b>09</b> | <b>16</b> |
|  | <b>Total</b>  | <b>24</b> | <b>40</b> |
| (Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.) |   |           |           |

## Section II

| Sr. No.   | Topics / Sub-topics | Lectures (Hours) | Theory Evaluation (Marks) |
|---|---------------------|------------------|---------------------------|
| <b>Course Outcome - CEG509-4-Implement sanitary land filling and composting method of disposal.</b> |                     |                  |                           |

|   |  |    |    |
|---|--|----|----|
| 4   | <p><b>Municipal solid Waste Disposal by Sanitary Landfilling and Composting Method-</b></p> <p><b>4.1-Sanitary landfilling Method-</b><br/> 4.1.1-Sanitary landfilling technique.<br/> 4.1.2- Factors to be considered for Site selection.<br/> 4.1.3- Land filling Methods-Area method, Trench method, Ramp method.<br/> 4.1.4- Leach ate and its control<br/> 4.1.5-Control of contamination of ground water.<br/> 4.1.6-Advantages and disadvantages of land filling methods.</p> <p><b>4.2- Composting Method –</b><br/> 4.2.1-Theory of Composting-Principles of composting process.<br/> 4.2.2-Factors governing Composting process<br/> 4.2.3-Benefits of composting,<br/> 4.2.4-Process before Composting<br/> 4.2.5-Methods of Composting –<br/> a)Manual composting - Bangalore method, Indore method, 14 days method, Anaerobic method<br/> b) Mechanical composting plant – Dano process,<br/> c)Vermi composting- concept, composting at home .</p> | 10 | 16 |
| <b>Course Outcome-CEG509-5-Implement Incineration method of disposal and industrial waste disposal.</b> |  |    |    |
| 5   | <p><b>Incineration of Waste and Disposal of Industrial Waste-</b></p> <p><b>5.1- Incineration of Waste-</b><br/> 5.1.1-Introduction of incineration process.<br/> 5.1.2-Need of incineration<br/> 5.1.3-Types of incinerators-Multiple chamber Incinerator, Municipal Incinerator<br/> 5.1.4-Pyrolysis of waste- Definition and methods.<br/> 5.1.5-Advantages and disadvantages of incineration process.</p> <p><b>5.2-Industrial Waste Disposal –</b><br/> 5.2.1- Responsibility of industry.<br/> 5.2.2- Recycling of industrial waste<br/> 5.2.3- The problem of disposal of industrial waste -<br/> 5.2.4- Industries producing mainly organic wastes like - Fruit processing, Slaughter-house waste.<br/> 5.2.5-E-Waste- Definition, varieties Dangers, Recycling, Disposal.</p>   | 10 | 16 |
| <b>Course Outcome - CEG509-6-Implement the relevant laws related to solid waste management.</b>         |  |    |    |

|   |   |           |           |
|---|---|-----------|-----------|
| <b>6</b>  | <b>Legal Aspects of Solid Waste Management.</b><br>6.1-Legal aspects-present scenario<br>6.2-Municipal Solid Waste Management Rules,2016<br>6.3- Biomedical Waste Management Rules,2016<br>6.4- E- Waste Management Rules,2016<br>6.5- Construction and Demolition Waste Management Rules,2016<br>6.6- Hazardous and other Waste Management Rules,2016<br>6.7-Plastic Waste Management Rules,2016<br>6.8-Role of central Pollution Control And Maharashtra Pollution Control Board in Management of Solid Waste from various sources. | <b>04</b> | <b>08</b> |
|   | <b>Total</b>  | <b>24</b> | <b>40</b> |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |           |           |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic  | Distribution of marks (Cognitive level-wise) |            |             | Course Outcome | Total Marks |
|-----------|--|--|------------|-------------|----------------|-------------|
|           |  | Remember                                     | Understand | Application |                |             |
| 1         | Fundamentals of Solid  | 04   | 04         | 02          | CEG509-1       | 10          |
| 2         | Storage, Collection and Transportation of Municipal Solid Waste-                 | 04   | 04         | 06          | CEG509-2       | 14          |
| 3         | Biomedical waste, health aspects and Public involment in Solid waste Management. | 04   | 06         | 06          | CEG509-3       | 16          |
| 4         | Municipal solid Waste Disposal by Sanitary Landfilling and Composting Method-    | 04   | 06         | 06          | CEG509-4       | 16          |
| 5         | Incineration of Waste and Disposal of Industrial Waste-                          | 04   | 04         | 08          | CEG509-5       | 16          |
| 6         | Legal Aspects of Solid Waste Management.   | 04   | 02         | 02          | CEG509-6       | 08          |
| TOTAL     |  | 24   | 26         | 30          | -----          | 80          |

(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.)

**A) INDUSTRIAL EXPOSURE :**

| SN | Mode of Exposure   | Topic              |
|----|--|--------------------|
| 1. | Field Visits<br>1.Existing solid waste collection and disposal methods of a town or city | Every theory topic |

**B) INSTRUCTIONAL STRATEGIES :**

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About 15-20% of the topics/subtopics which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

**Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio presentations
4. Question Bank

**REFERENCE MATERIAL:**

**a. Books / Journals / IS Codes / Websites**

| Sr. No. | Author                          | Title   | Publisher                                     |
|---------|---------------------------------|---|---|
| 1       | Dr. A. D. Bhide                 | Solid Waste Management                              |   |
| 2       | Gorge Techobanoglous            | Solid Wastes  | – McGraw Hill                                 |
| 3       | Pavoni                          | Hand Book on Solid Waste Management                 |   |
| 4       | Gottas                          | Composting -  |   |
| 5       | Khopkar S.M. (1993)             | Environmental Pollution Annalysis                   | New Age International (p) Limited .           |
| 6       | Rao C. S.                       | Environmental Pollution Control Engineering.        | Wiley Eastern Limited                         |
| 7       | S.K. Garg.                      | Sewage disposal and air pollution Engineering       |   |
| 8       | Edwards and Lofty .             | Earthworm Biology.                                  |   |
| 9       | Anubha Kaushik & C.P. Kaushik - | Perspectives in Environmental Studies               | New Age International (p) Limited, Publishers |
| 10      | D.L.Manjunath                   | Environmental studies                               | PEARSON Publication                           |
| 11      | AninditaBasak                   | Environmental studies                               | PEARSON Publication                           |
| 12      | B.B. Hosetti                    | Prospect and Perspectives of Solid Waste Management | New Age International Limited                 |

**b. Websites:**

1. [www. hsagolden.com](http://www.hsagolden.com)
2. [www.almitrapatel.com](http://www.almitrapatel.com)
3. [www.yousee.in](http://www.yousee.in)
4. [www.skgsangha.o](http://www.skgsangha.o)
5. [www.epa.gov/epaoswer/non-hw/municipal/index.htm](http://www.epa.gov/epaoswer/non-hw/municipal/index.htm)
6. En. [Wikipedia.org/waste-management](http://Wikipedia.org/waste-management)



**COURSE ID :**

**Course Name : Watershed Management**  
**Course Code : CEG510**  
**Course Abbreviation : GWSM**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : Nil**

**Teaching Scheme:**

| Scheme component | Hours / week | Credits |
|------------------|--------------|---------|
| Theory           | 3            | 3       |
| Practical        | --           |         |

**Evaluation Scheme:**

| Mode of Evaluation    | Progressive Assessment                |           | Term End Examination            |       | Total |
|-----------------------|---------------------------------------|-----------|---------------------------------|-------|-------|
|                       | Theory                                | Practical | Theory Examination              | OR/PR |       |
| Details of Evaluation | Average of two tests of 20 marks each | --        | Term End Theory Exam (03 hours) | --    |       |
| Marks                 | 20                                    | --        | 80                              | --    | 100   |

**Rationale:**

Water resources play a very important role in the overall development of a country like India. Day by day these resources are becoming scarce & users are multiplying in larger numbers. The drinking water and other purpose water problem is becoming very serious day by day in rural as well as urban area. It is need of the hour to adopt scientific approaches for making use of water resources judiciously and intelligently. Water resources need to be conserved at all cost keeping in mind the future demands. This situation may be improved by carrying watershed development works.

Watershed management implies the judicious use of all the resources i.e land, vegetation and water of the watershed to achieve maximum productivity with minimum hazard to the natural resources and for the well being of mankind. Different water conservation measures undertaken in an integrated manner will be useful to manage the available water resources effectively. This course which include the study related to planning, design, construction and maintenance of different structures associated with soil and water conservation measures will enable the diploma civil engineer to be the professional in that area.

**COMPETENCY**

Applying knowledge of effective planning and management to conserve the soil and water.

**Cognitive:** Understanding and applying knowledge of Watershed Management.

**Psychomotor:** Conducting site visit to conserve the soil and water.

**Affective:** Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

**Course Outcomes:**

- CEG510 -1** Understand the importance and uses of water resources, concept of watershed  
**CEG510 -2** Study the methods of runoff computation and understand soil erosion  
**CEG510 -3** Understand the methods of water harvesting and ground water recharge  
**CEG510 -4** Deciding the various water conserving measures.  
**CEG510- 5** Management of various watershed works  
**CEG510 -6** Understand the socio-economic aspects in watershed management

**COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX**

| Programme Outcomes POs and PSOs  |   |                          |   |  |  |                            |                            |                         |                                      |                                  |
|--|---|--------------------------|---|--|--|----------------------------|----------------------------|-------------------------|--------------------------------------|----------------------------------|
| Competency and COs   | PO 1<br>Basic & Discipline specific knowledge | PO 2<br>Problem analysis | PO 3<br>Design/development of solutions | PO 4<br>Engineering Tools, Experimentation & Testing | PO 5<br>Engineering practice for society, sustainability & environment | PO 6<br>Project management | PO 7<br>Life-long learning | PSO1<br>Plan and Design | PSO2<br>Construction and Maintenance | PSO3<br>Problem Solving on field |
| Applying knowledge of effective planning and management to conserve the soil and water.      | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <i>CEG510 -1 Understand the importance and uses of water resources, concept of watershed</i> | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <i>CEG510 -2 Study the methods of runoff computation and understand soil erosion .</i>       | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <i>CEG510 -3 understand the methods of water harvesting and ground water recharge.</i>       | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <i>CEG510 -4 Deciding the various water conserving measures.</i>                             | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <i>CEG510- 5 Management of various watershed works</i>                                       | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |
| <i>CEG510 -6 understand the socio-economic aspects in watershed management</i>               | 3   | 2                        | 2                                       | 2  | 3  | 2                          | 2                          | 3                       | 3                                    | 2                                |

**Section I**

| Sr. no.   | Topics   | Teaching (Hours) | Theory evaluation Marks |
|---|--|------------------|-------------------------|
| <b><i>Course Outcome CEG510 -1 Understand the importance and uses of water resources, concept of watershed</i></b>  |  |                  |                         |
| <b>1</b>  | <b>Introduction</b><br>1.1 Water resources-types and its availability, its use, Classification of water resources,<br>1.2 Concept of water shed, watershed characteristics, Objectives Of watershed management<br>1.3 Watershed management, and practices, factors affecting watershed management<br>1.4 Soil degradation, causes, and effects.<br>1.5 Integrated multi disciplinary approach for watershed ,  | <b>08</b>        | <b>12</b>               |
| <b><i>Course Outcome CEG510 -2 Study the methods of runoff computation and understand soil erosion .</i></b>  |  |                  |                         |
| <b>2</b>  | <b>Run off and soil erosion</b><br>2.1 Run off computation- Rational Method, Runoff formula- Inglis formula for ghat and non ghat area, Time of concentration(simple numerical on runoff computation)<br>2.2 Importance of soil & soil survey, Soil erosion- Definition,erosion problem, types of erosion, factors affecting soil erosion.<br>2.3 Water erosion - factors affecting water erosion, gulley erosion, rain drop erosion, sheet erosion , rill erosion, Mechanics of water erosion | <b>08</b>        | <b>14</b>               |
| <b><i>Course Outcome CEG510 -3 understand the methods of water harvesting and ground water recharge.</i></b>  |  |                  |                         |
| <b>3</b>  | <b>Water harvesting and Ground water recharge.</b><br>3.1 Water Harvesting - importance , harvesting principles Water Harvesting techniques- Roof harvesting, Runoff harvesting , and Flood water harvesting<br>3.2 Artificial recharge of ground water –Spreading method Induced recharge method, recharge –well method , subsurface dams, Waste water recharge, recharge by urban storm runoff.  | <b>08</b>        | <b>14</b>               |
| <b>Total</b>  |  | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |  |                  |                         |

**Section II**

| Sr. no.   | Topics  | Teaching (Hours) | Theory evaluation Marks |
|---|---|------------------|-------------------------|
| <b><i>Course Outcome CEG510 -4 Deciding the various water conserving measures.</i></b>  |   |                  |                         |
| 4   | <b>Water Conservation Measures.</b><br><b>Agronomic measures</b><br>4.1 Contour farming, strip cropping and tillage practices.<br>4.2 Supportive practices-mulching, pastures, grazing practices,<br><b>4.3 Mechanical Measures-</b><br>Bunding- types, contour bunding and graded bunding, Design criteria, alignment & construction, surplus arrangement, Contour trenching-graded trenches and staggered trenches, Grassed water ways –location, selection of suitable grasses, construction and maintenances, Terraces- Classification, bench terraces- types, design, construction, limitations, maintenance, Terraces system-Planning, construction, maintenances, broad based terraces, conservation ditches, Gully control measures-Vegetation, Gully control structures- gully plugging Check dam- classification-temporary check dam, semi permanent check dam and permanent check dams –cement bandhara, earthen bandhara, gabion structure, biological bandhara, underground bandhara, Farm ponds- types, Components, selection of site, design construction, maintenances. | <b>14</b>        | <b>22</b>               |
| <b><i>Course Outcome CEG510- 5 Management of various watershed works</i></b>  |   |                  |                         |
| 5   | <b>Planning of watershed works-</b><br>5.1 Watershed description, watershed problems, proposed Watershed management programmes, effect of watershed works, comparison of benefit cost ratio,<br>5.2 Formulation of project proposal for watershed management work, steps of watershed management, evaluation.   | <b>06</b>        | <b>10</b>               |
| <b><i>Course Outcome CEG510 -6 Understand the socio-economic aspects in watershed management.</i></b>   |   |                  |                         |
| 6   | <b>Socio – Economic Aspects</b><br>6.1 Organizational Set-up for irrigation & soil conservation administration in Govt. sector, liason between officers and co-operation amongst various agencies & people.<br>6.2 Role of Engineers, farmers and Govt.<br>6.3 Water charges and Betterment levy<br>6.4 Social attributes and values.   | <b>04</b>        | <b>08</b>               |
| <b>Total</b>  |   | <b>24</b>        | <b>40</b>               |
| Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. |   |                  |                         |

**Specification table for setting question paper for semester end theory examination:**

| Topic No. | Name of topic                               | Distribution of marks (Cognitive level-wise) |            |              | Course Outcome | Total Marks |
|-----------|---|--|------------|--------------|----------------|-------------|
|           |   | Remember                                     | Understand | Applica-tion |                |             |
| 1         | Introduction                                | 4  | 4          | 4            | CCF510-1       | 12          |
| 2         | Run off and soil erosion                    | 2  | 6          | 6            | CCF510-2       | 14          |
| 3         | Water harvesting and Ground water recharge. | 6  | 4          | 4            | CCF510-3       | 14          |
| 4         | Water Conservation Measures.                | 6  | 8          | 8            | CCF510-4       | 22          |
| 5         | Planning of watershed works.                | 4  | 4          | 2            | CCF510-5       | 10          |
| 6         | Socio Economic Aspects                      | 2  | 4          | 4            | CCF510-6       | 08          |
| TOTAL     |   | 24   | 26         | 30           |                | 80          |

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**Instructional strategies:**

- i. Lectures.
- ii. Assignments.
- iii. Site visits
- iv. Group discussion /Seminar

**Teaching and Learning resources, including references:**

1. Chalk-board.
2. LCD projector.
3. OHP presentation
4. Visits

| Reference Books :<br>Sr. No. | Title   | Author          | Publisher                                   |
|------------------------------|---|-----------------|---|
| 1                            | Soil and Water Conservation Engineering           | R. Suresh       | Standard Distributer, New Delhi             |
| 2                            | Watershed management                              | J. V. S. Murthy | New Age International publishers New Delhi. |
| 3                            | Ground water assessment, development & management | R. K. Karanth   | Tata Mc Grahil Publication                  |
| 4.                           | Watershed management                              | N.D.Mani        | Saujanya Books, 165-E, Kamla Nagar Delhi -7 |
| 5                            | Watershed Planning and                            | Rajveer singh   | Yash Publishing House                       |

|   |                                 |                                   |  |
|---|---------------------------------|-----------------------------------|--|
|   | management                      |                                   |  |
| 6 | Watershed management            | V.V.Dhruvnarayana &<br>G. Shastry | Indian Council<br>Agriculture Research,<br>Krishi anusandhan<br>bhavan , PUSA , New<br>Delhi |
| 7 | Irrigation and<br>D.R. Mazumdar | -----                             | water management   |

**2. Websites:**

**[www.watershedindia.50megs.com](http://www.watershedindia.50megs.com)**  
**[www.watershed.nic.in](http://www.watershed.nic.in)**  
**[www.wotr.org/watersheddevelopment.html](http://www.wotr.org/watersheddevelopment.html)**  
**[www.indiawaterportal.org/channels/watershed-development](http://www.indiawaterportal.org/channels/watershed-development)**  
**[www.raiwaterharvesting.org](http://www.raiwaterharvesting.org)**  
[www.watershed.org](http://www.watershed.org)

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