GOVERNMENT POLYTECHNIC, KOLHAPUR

(An Autonomous Institute of Government of Maharashtra)

Curriculum Document

CURRICULUM: MPECS-2016

For

DIPLOMA IN SUGAR MANUFACTURING

Secretary **Chairman**

Programme-wise Board of Studies (PBOS)

Diploma in Sugar Manufacturing 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

1. CURRICULUM DEVELOPMENT : INTRODUCTION AND PROCESS

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 skills are imbibed in the minds of 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 field requirements. Keen attention has been provided to make it more structured by incorporating the valuable suggestions of industrial experts of PBOSs 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 impact 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 amongst the students in pursuing their preparedness to cope up with the global changes. It aims to promote self reliance and satisfaction of acquiring modern civil engineering concepts and multi capabilities within the students to make them model technicians.

"Curriculum is an educational program designed and implemented to achieve specified educational objectives." viz…

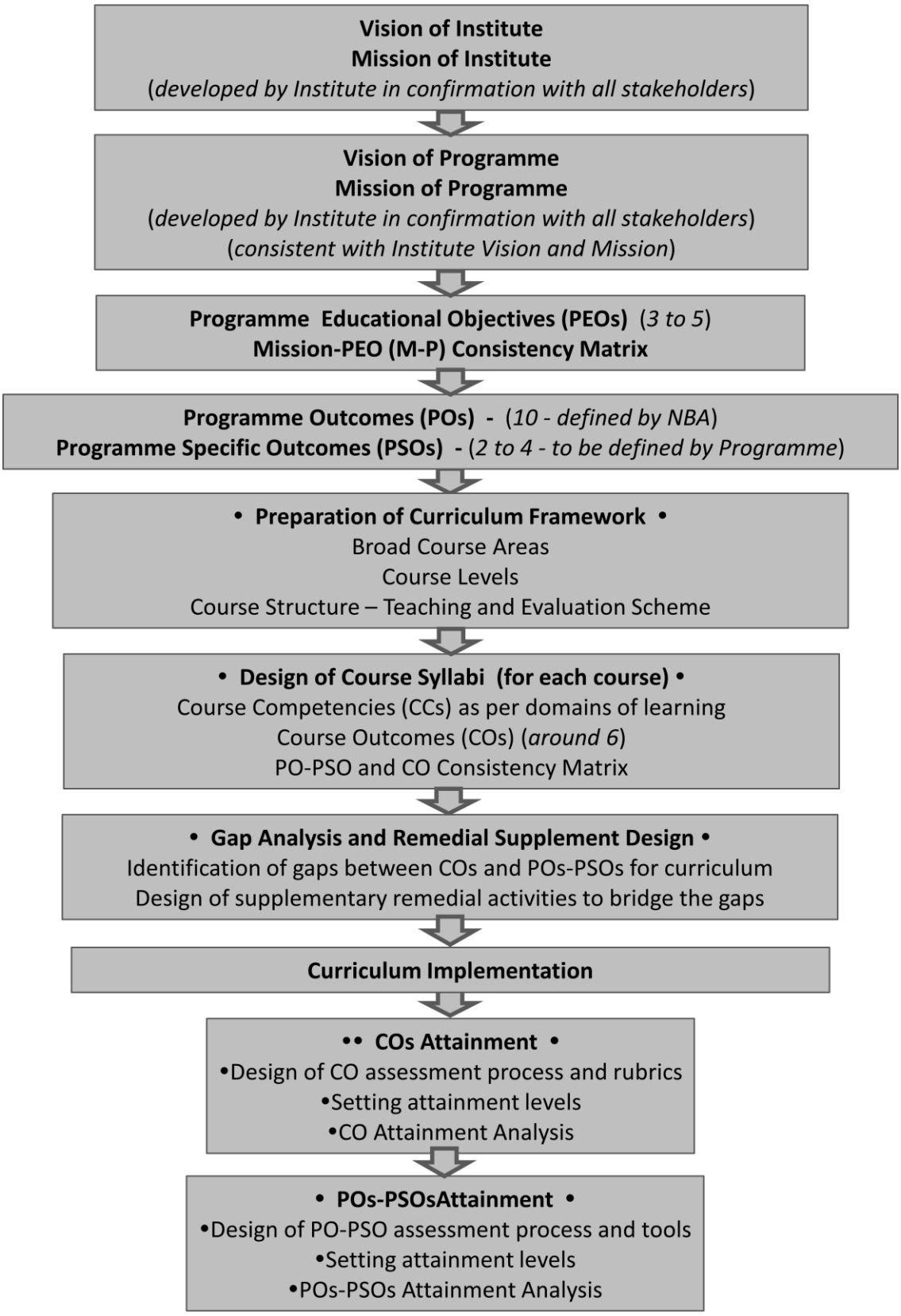
- To define the purpose of education
- To accept systematic planning methods
- To confirm implementation strategies
- To identify and to incorporate needs of industries
- To follow the policy directives
- To cope-up with social concerns
- To aim at Personality development of students
- To allow future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

Outcome-based Curriculum

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 States. National Board of Accreditation (NBA), India has become the permanent signatory member of the Washington Accord on 13thJune 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-2016 - It is the Curriculum of the Institute revised in the year 2016. It is applicable to the students admitted since 2016

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

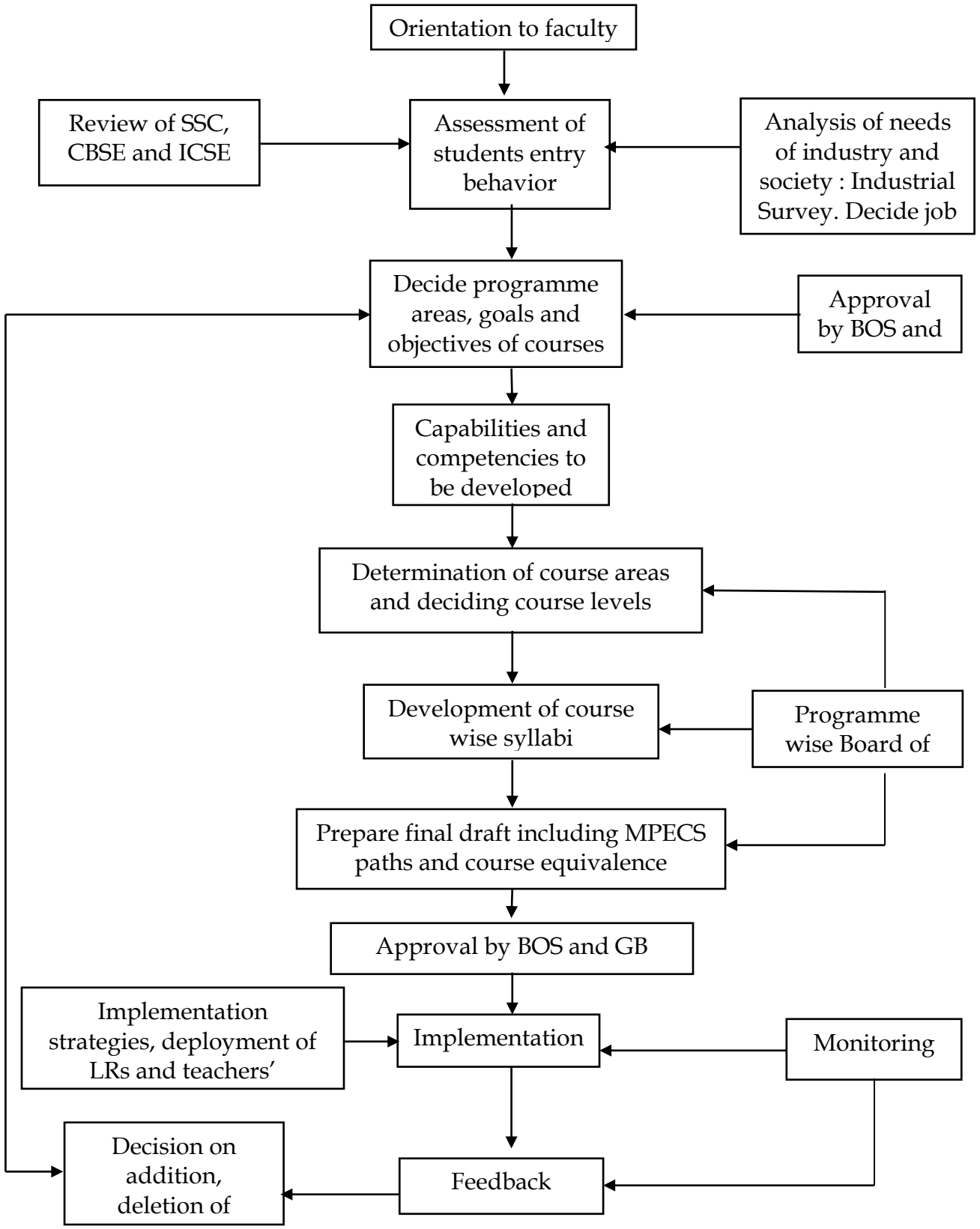
Programme Dean – He/she is the Head of Department of a Programme Department

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. PROGRAMME AIMS AND JOB PROFILES

The Curriculum for Sugar Manufacturing Programme is primarily developed, with the focus on large size organizations (Sugar Factories) in and around the region. The enterprises will be production, manufacturing, repair and maintenance, services to the community etc. The enterprises may be private sector, public sector, government sector where Diploma holder in Sugar Manufacturing may work as Supervisor, Technician, Junior Technologist, Assistant Manager or he may become an entrepreneur.

The main aims of Sugar Manufacturing programme are to induce the following qualities in the diploma holder.

SOCIAL SKILLS

1) To be a good citizen
2) Answer questions and proposals in appropriate manner.
3) Prepare and impact instructions to pears / subordinates.
4) Write letter reports and proposals in appropriate manner.
5) Develop and attitude to work in team for achieving goals.
6) Develop listening skills and respect for other operations.
7) To learn use of library, literature and gathering of information.
8) Develop skills to work independently for problem solving
9) To develop creative thinking.

TECHNICAL SKILLS

1) Develop supervisory and managerial skills
2) Use of different types of Measuring instruments
3) Knowledge of statistical quality control techniques used in industry
4) To apply decision making techniques.
5) Knowledge of using readily available design data
6) Ability to detect faults and repairs of Sugar Factory Equipments
7) Knowledge of using readily available design data
8) Knowledge of different types of materials and their properties
9) Negotiation techniques in different situations
10) Knowledge of identifying the required techniques of time study and method study for different production processes.
11) Carry out time study and method study by using standard methods
12) Preparing process sheets and flow charts
13) Knowledge of different types of lubricants and coolants
14) Draw, read, interpret working drawings
15) Understanding use of PERT techniques, BAR charts applicable to different mechanical engineering situations.
16) Develop attitude of safety consciousness
17) Use of various safety devices
18) Knowledge of standard procedure for estimating and costing of products
19) Preparation of project report for Small – scale industries and medium scale industries.
20) Market Survey
21) Awareness of government rules
22) Knowledge of various parts and equipments used in Sugar Manufacturing Process

23) Detect and rectify the faults of Sugar Manufacturing process
24) Using of appropriate software for data processing
25) Awareness of using computer in proper way
26) To prepare simple computer programmes and execute
27) Maintenance history cards of Machine and instruments
28) Elementary exposure to ISO 9000

Aims of Sugar Manufacturing Programme are prepared in order to have various technical skills and abilities to be acquired by the Diploma holder in Sugar Manufacturing. So that he can fulfilled industrial requirements precisely as per respective Job Profile.

LAB IN- CHARGE:

1.To monitor work in laboratory .
2.To administer office work
3. To furnish necessary information to the chief chemist, Managing Director, other Departmental heads , Government & semi Government authorities.
4.To prepare various formats statements , reports time to time and submit where its need.
5.To observe entries in the various Registers kept at various station for year preparation of records
6.To observed entries in register and actual production output match with each either .
7.To control Mill sanitation and to see the sanitation as well is remarkable .
8.To check the calibrated all weighment equipment of juice, water , molasses and sugar
.9.To maintain all registers, records, logbook of departmental, central excise and state Excise department and other semi government offices.
10.To issue instruction to subordinate as regards the functioning of laboratory.
11.To maintain discipline in laboratory.
12.To observe the safety of worker and chemical used.
13.To keep laboratory clean and keep good housekeeping.
14.To acts as quantity control person.
15.To identify trainee need of sub-ordinate.

MANUFACTURING CHEMIST:

1.To control process of clarification , evaporation, Crystallization and finally production during shift period .
2.To see that production efficiency norms are observed .
3.To issue instruction to the sub-ordinates as regards functioning of the Department.
4.To furnish the necessary information to the Chief Chemist where ever necessary .
5.To administer the work from boiling house to finish house.
6.To enrich the quality of final product .
7.To cope with the expectation of Management and subordinate .
8.To observe the safety of water which on work.
9.To observe the entries in the register kept at various station .
10.To see the entire and actual production out put match with each other and tallied.

11.To advise in writing to the chief chemist and Managing Director wherever necessary And whatever ask for.
12.To identify and report training need of sub-ordinate.

13.To see the units in production process are functioning properly.
14.To report time to time any problem observed and discussed with Chief Chemist neatly and friendly.
15.To liaise with other department .
16.To administrate discipline with the staff and Department.
17.To see the situation in the department is remarkable.
18.To redress the grievance at shop floor.

CHIEF CHEMIST:

* To see that the units in the departments are functioning properly.
* To see that the production efficiency norms are observed.
* To control the process cost.
* To issue instructions to the subordinates as regards functioning of the Department.
* To redress the grievances at Shop Floor.
* To furnish the necessary information to the Managing Director & to the Board of Directors, to other Departments & to Govt. / Semi- Government Authorities wherever necessary .
* To see the sanitation in the Departments is remarkable.
* To administer the discipline amongst the staff & Department.
* To administer the work from boiling house to Sugar Godown.
* To enrich the quality of final product.
* To liaise with the other department.
* To cope with the expectations of Management & sub-ordinates.
* To observe the safety of worker while on work.
* To monitor work in the Laboratory.
* To observe the entries in the registers kept at various stations.
* To see entries & actual production out-put match with each other & tallied.
* To participate in the discussions along with other officers, Managing Director & Board of Directors.
* To advise in writing to the Managing Director & Board of Directors wherever necessary & whenever asked for.
* To identify trainee needs of sub- ordinates.
* Member of Management Review meeting.

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 the Programme:

Programme of high recognition with state of art training and facility centre to develop competent technicians for sugar industry.

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Mission of the Programme:

- To enhance the employability of the individual by giving emphasis on multi-skilling.
- Enable the learner to enter a broader spectrum of career paths and would be employable in other sectors as well. Other sectors could include manufacturing and processing sectors.
- To enable the learners who want to fallow a highest career in the field of sugar Industry or allied industry.
- To provides exhaustive in-plant training to learners to gain relevant experiences in the workplace.

Programme Educational Objectives (PEOs):

- **PEO 1:** Skill based Workforce/Manpower to support shop floor and field operations of Sugar Industry
- **PEO2:** Students with a thorough knowledge of sugar manufacturing process with a solid foundation in mathematical, scientific and engineering fundamentals required to develop problem solving ability.
  .
- **PEO 3: S**tudents are trained in comprehending, analyzing, designing and utilizing the advanced technologies that provide solution frameworks to real world problems.

Programme Outcomes (POs)

1. **Basic knowledge:** An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems.

2. **Discipline Knowledge:** An ability to apply discipline- specific knowledge to solve core and/or applied engineering problems**.**

3. **Experiments and practice:** An ability to plan and perform experiments and practices and to use the results to solve the engineering problems.

4. **Engineering Tools:** Applied appropriate technology and tools with and understanding of the limitations.

5. **The Engineer and society :** Demonstrate knowledge to asses societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice

6. **Environment and sustainability:** Understand the impact of the engineering solutions in societal and environmental contexts and demonstrate the knowledge and need for sustainable development.

7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

8. **Individual and team work :** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

9. **Communication:** An ability to communicate effectively.

10. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life –long learning in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES

PSO-I: Plan and Organize

An understanding of Strengths and Weaknesses of an Individual or Learners in their:

- Technical Knowledge and Skills(such as Technical Skills, Integration, Problem Identification, Troubleshooting)

PSO-II: Production and Management

An understanding of Strengths and Weaknesses of an Individual or Learners in their:

- -Team and Interpersonal Attributes (Social Skills, Cooperation, Coordination, Communication Skills: Verbal/ Written, Initiative and Independence.)
- -Professional or Technological Practices (Time Management, Critical Thinking, Problem Solving, Application of Knowledge, Decision Making, Diligence & Ethics,)

3. OVERVIEW AND SALIENT FEATURES OF CURRICULUM: MPECS-2016

3.1 Overview of Curriculum MPECS-2016

Total Credits	180
Total no. of courses	33
Max. no. courses in a semester	07
Total Maximum Marks	4000
Level IV and V	
Courses, **Credits and** **Marks***	12 78 1600
Level I	
Courses, **Credits and** **Marks**	09 42 925
Level II	
Courses, **Credits and** **Marks**	04 16 325
Level III	
Courses, **Credits and** **Marks**	08 44 1150
Level IV	
Courses, **Credits and** **Marks**	08 40 1100
Level V	
Courses, **Credits and** **Marks**	04 38 500
TH : PR Credits Ratio	41% : 59%
TH : PR Marks Ratio	59% : 41%
No. of Allied Courses	01 out of Four
No. Optional Courses	04 with 03&04 options
No. of Practical Exams	08 (I) 07 (E)
No. of Orals	06 (I) 07 (E)

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

3.2 Salient Features of Curriculum MPECS-2016

Addition and deletion of Courses as compared to previous MPECSs with justification:

Eliminated Course: As a common policy.

Level 2: CCE 204 ENVIRONMENTAL STUDIES.

Introduced following New Courses: By eliminating or keeping as Elective the less applicable Courses; more relevant or useful Course (Program Oriented).as a compulsory Course can be included to make the Program more applicative. (As per Instructions of Hon. Director of MSBTE Dr Khodake Sir)

The following Newly Introduced Program Oriented Course in Level 3 as compulsory is to be taught in Odd Term (Third Semester)

Compulsory	**SMF301 SUGAR FACTORY PRACTICES**
Elective any one from:	SMF 308 CHEMICAL PROCESS TECH. SMF 309 BASIC ELECTRICAL ENGG SMF 310 APPLIED MATHEMATICS SMF 311 BASIC CIVIL ENGG.

Level 5: Introduced following New Course: As a common policy.
SMF 506 ENERGY CONSERVATION & AUDIT

Compulsory **CCF 503 INDUSTRIAL ORGANIZATION & MANAGEMENT**

As a common policy, IOM will be Common to all Discipline and to make End Exam online existing Sugar Industry Management have been eliminated from Elective and made Compulsory as CCF 501 INDUSTRIAL ORGANIZATION & MANAGEMENT

Since the majority content of SMF 506 ENERGY CONSERVATION & AUDIT have been covered in existing SMF 504 COGENERATION TECHNOLOGY, hence included in Program as Elective

Elective any one from:	SMF 504 COGENERATION TECHNOLOGY SMF 505 ALCOHOL TECHNOLOGY SMF 506 ENERGY CONSERVATION &AUDIT

Major modifications in Course Contents:

As per industrial survey and alumni that there is less use of Applied Mathematics in Sugar Industry in handling problems. So it is decided that instead of Applied Mathematics add other sugar manufacturing related subject. So that student will gate benefits while performing task in factory. Therefore we added SMF301 SUGAR FACTORY PRACTICES & APPLIED MATHEMATICS SMF310 is kept as a optional subject.

Changes in Implementation Strategy and Treatment:

In the 5th Level for the Course SMF 502 SUGAR INDUSTRY IN- PLANT TRAINING having 28 Credits /week; the student will undergo for Practical Training of 20 weeks in the nearby Sugar Industry. The students are generally placed in various sugar Factories / Industries which are in vicinity of the Institute or elsewhere in other Industries which are far off from the Institute. The concerned Teachers who have been entrusted and deputed will supervise and guide the students personally by visiting the Industry.

Since some of the Factories may be at far distance from the Head Quarter and require some time period to reach there to carry out supervision and guidance work for students. Hence sometimes regular supervision and equal distribution of working hours may not possible practically; due to shortage of Faculty and the distance of Industries. In such condition whenever supervision of such Students (undergone In-plant Training are far away from the Institute) is not possible, a Group or Batch of maximum number of students allowed for In-Plant Training in Sugar Industry (4-6 students) should be formed to monitor the training.

For effective implementation & justification of Academic Load of the concerned Teacher it is expected to call the respective Group of Students at Institute / Industry (weekly without hampering the Training) for teaching and performing/ carrying out some practical in the Department (which are essential for course contents). The concerned Teacher will also guide the students w r t the problems which may arise during actual In-plant Training
For a Group or Batch of 4-6 students a Teaching / Practical load of 4 Hrs / Week / Faculty / Group shall be considered as an Academic Load of Department. This consideration will help to rationalize/equalize the total load of 28 Credits / week of the Course**.**

4. TEACHING AND EXAMINATION SCHEME (LEVEL-WISE)

SN	Name of Course	Course Code	Course Abbreviations	LVL	PRE REQ	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)					
						TH	PR/ DR TT	CRD TS	TH	TS	PR	OR	TW	TOT
	Level 1: Foundation Courses (All Compulsory)													
1	ENGG PHYSICS	CCF 101	FPHA	1	NA	4	2	6	80	20	50	0	0	150
2	ENGG CHEMISTRY	CCF 103	FCHA	1	NA	4	2	6	80	20	50	0	0	150
3	BASIC MATHEMATICS	CCF 105	FBMT	1	NA	3	1	4	80	20	0	0	0	100
4	ENGG MATHS	CCF 106	FEMT	1	CCF 105	3	1	4	80	20	0	0	0	100
5	ENGG DRAWING-I(SM)	CCF 117	FEDC	1	NA	2	4	6	0	0	50	0	25	75
6	ENGG DRAWING-II	CCF 108	FEDB	1	CCF 117	2	4	6	80	20	0	0	25	125
7	APPLIED MECHANICS	CCF 110	FAPM	1	NA	4	2	6	80	20	0	0	25	125
8	W S PRACTICES-I	CCF 112	FWSB	1	NA	0	2	2	0	0	0	0	50	50
9	W S PRACTICES-II	CCF 116	FWSF	1	CCF 112	0	2	2	0	0	0	0	50	50
						22	20	42	480	120	150	0	175	**925**
	Level 2 : Life Skills and Professional Skills Courses (All Compulsory)													
1	GENERIC SKILLS	CCF 201	FGNS	2	NA	2	2	4	0	0	50	0	25	75
2	COMMUNICATION SKILL	CCF 202	FCMS	2	CCF 201	2	2	4	40	10	25	0	0	75
3	PROFESIONL PRACTICES	CCF 203	FPRP	2	-	1	2	3	0	0	0	50	25	75
4	C- PROGRAMMING	SMF 205	FCOP	2	-	1	4	5	0	0	50	0	50	100
						6	10	16	40	10	125	50	100	**325**
	Level 3: Basic Technology Courses (All Compulsory)													
1	SUGAR FACTORY PRACTICES	SMF 301	FSFP	3	-	0	4	4	00	00	50*	25*	25	100
2	BASIC SUGAR ENGG	SMF 302	FBSE	3	-	4	2	6	80	20	-	25*	25	150
3	BASIC SUGAR MANUFACTURING	SMF 303	FBSM	3	-	3	3	6	80	20	25*	0	25	150
4	INTROD TO SUAGR MANU	SMF 304	FISM	3	NA	3	3	6	80	20	0	25	25	150
5	SUG FACTORY EQUIP	SMF 305	FSFE	3	-	3	4	7	80	20	25*	0	25	150
6	MECH FLUID FLOW OPR	SMF 306	FMFO	3	-	3	2	5	80	20	0	25	25	150
7	MASS & HEAT TRANSFR	SMF 307	FMHT	3	-	3	2	5	80	20	0	25	25	150
8	**Elective 1- Basic Technology Courses (Any One)**													
	CHEM PROCES TECH.	SMF 308	FCPT	3	-	3	2	5	80	20	0	25	25	150
	BASIC ELECTRICL ENGG	SMF 309	FBEE	3	-	3	2	5	80	20	0	25	25	150
	APPLIED MATH	SMF310	FAMT	3	-	3	2	5	80	20	0	25	25	150
	BASIC ELCIVIL ENGG	SMF 311	FBCE	3		3	2	5	80	20	0	25	25	150
						22	22	44	560	140	100	150	200	**1150**

SN	Name of Course	Course Code	Course Abbreviations	LVL	PRE REQ	TH	PR/ DRTT	CR DTS	TH	TS	PR	OR/ TU	TW	TOT
	Level 4: Applied Technology Courses (All Compulsory)													
1	SUGAR ENGG	SMF 401	FSUE	4	SME302	2	2	4	80	20	0	25*	25	150
2	SUGAR MANU.-I	SMF 402	FSUM-I	4	-	3	3	6	80	20	25*	0	25	150
3	SUGAR MANU.- II	SMF 403	FSUM-II	4	SME402	3	3	6	80	20	25*	0	25	150
4	BY PRODCT OF SUGAR	SMF 404	FBPS	4	-	2	2	4	80	20	0	25*	25	150
5	SUGAR CHEM CONTRL	SMF 405	FSCC	4	-	2	2	4	80	20	25	0	25	150
6	CAPACITY DESIGN & CALCULATION	SMF 406	FCDC	4	-	4	2	6	80	20	25*	0	25	150
7	COMPUTER APPLICATN	SMF 407	FCOA	4	-	0	4	4	0	0	25	0	25	50
8	**Elective 2 - Applied Technology Courses (Any One)**													
	SUGAR FACT MAINT.	SMF 408	FSFM	4	-	2	4	6	80	20	0	25*	25	150
	INDUSTRIAL ENGG	SMF 409	FINE	4	-	2	4	6	80	20	0	25*	25	150
	PLANT MAINT ENGG	SMF 410	FPME	4	-	2	4	6	80	20	0	25*	25	150
						18	22	40	560	140	125	75	200	**1100**
	Level 5: Management & Diversified Technology Courses (All Compulsory)													
1	INDUSTRIAL ORGANISATION &. MANGMNT	CCF 501	FIOM	5	-	3	0	3	80	20	0	0	0	100
2	SEMINAR	SMF 502	FSEM	5	-	0	2	2	0	0	0	25	25	50
3	INPLANT TRAINING	SMF 503	FIT	5	SMF403 SMF 405 SMF 406	0	28	28	00	PST 50	WR 50	50*	50	200
	Note: - PST = 2 tests (Each 25 Marks), WR = Weekly Report, TW = Project Report.													
4	**Elective 3 : Diversified Courses (Any One)**													
1	COGENRATION TECH	SMF 504	FCGT	5	-	3	2	5	80	20	0	25*	25	150
2	ALCOHOL TECH	SMF 505	FALT	5	-	3	2	5	80	20	0	25*	25	150
3	ENERGY CONSERVATION &AUDIT	SMF506	FECA	5	-	3	2	5	80	20	0	25*	25	150
						6	32	38	260	40	25	75	100	**500**

Optional Courses for Electives

SN	Name of Course	Course Code	Course Abbreviations	Level	PREQ	Teaching Scheme (hours per week)			Examination Scheme (marks)				
						TH	PR / DR / TT	Credits	TH	TS	PR	OR / TU	TW
	Elective - 1												
1	CHEM. PROCESSES TECH.	SMF 308	FCPT	3	-	3	2	5	80	20	0	25	25
2	BASIC ELECTRICAL ENGG	SMF 309	FBEE	3	-	3	2	5	80	20	0	25	25
3	APPLIED MATHS	SMF310	FAMT	3		3	2	5	80	20	0	25	25
4	BASIC CIVIL ENGG	SMF 311	FBCE	3		3	2	5	80	20	0	25	25
	Elective – 2												
5	SUGAR FACTORY MAINT.	SMF 408	FSFM	4	-	2	4	6	80	20	0	25 *	25
6	INDUSTRIAL ENGG	SMF 409	FINE	4	-	2	4	6	80	20	0	25 *	25
7	PLANT MAINT ENGG	SMF 410	FPME	4	-	2	4	6	80	20	0	25 *	25
	Elective – 3												
8	COGENRATION TECH	SMF 504	FCGT	5	-	3	2	5	80	20	0	25 *	25
9	ALCOHOL TECH	SMF 505	FALT	5	-	3	2	5	80	20	0	25 *	25
11	ENERGY CONSERVATION &AUDIT	SMF506	FECA	5	-	3	2	5	80	20	0	25 *	25

5. PATH-WISE COURSE STRUCTURES

Path-wise Course Structure

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

SN	Name of Course	Course Code	Course Abbvn	LVL	PRE REQ	Teach. Scheme (Hrs/week)			Examination Scheme (Marks)					
						TH	PR/TT/DR	CR	TH	TS	PR	OR	TW	TOT
	Semester 1													
1	ENGG PHYSICS	CCF 101	FPHA	1	NA	4	2	6	80	20	50	0	0	150
2	BASIC MATHEMATICS	CCF 105	FBMT	1	NA	3	1	4	80	20	0	0	0	100
3	ENGG DRAWING-I(SM)	CCF 117	FEDC	1	NA	2	4	6	0	0	50	0	25	75
4	APPLIED MECHANICS	CCF 110	FAPM	1	NA	4	2	6	80	20	0	0	25	125
5	W S PRACTICES-I	CCF 112	FWSB	1	NA	0	2	2	0	0	0	0	50	50
6	GENERIC SKILLS	CCF 201	FGNS	2	NA	2	2	4	0	0	50	0	25	75
						15	13	28	240	60	150	0	125	**575**
	Semester 2													
7	ENGG CHEMISTRY	CCF 103	FCHA	1	NA	4	2	6	80	20	50	0	0	150
8	ENGG MATHS	CCF 106	FEMT	1	CCF 105	3	1	4	80	20	0	0	0	100
9	ENGG DRAWING-II	CCF 108	FEDB	1	CCF 117	2	4	6	80	20	0	0	25	125
10	W S PRACTICES-II	CCF 116	FWSF	1	CCF 112	0	2	2	0	0	0	0	50	50
11	COMMUNICAT. SKILL	CCF 202	FCMS	2	CCF 201	2	2	4	40	10	25	0	0	75
12	INTRODUCTION TO SUAGR MANUFACTURNG	SMF 304	FISM	3	NA	3	3	6	80	20	0	25	25	150
						14	14	28	360	90	75	25	100	**650**
	Semester 3													
13	C- PROGRAMMING	SMF 205	FCOP	2	-	1	4	5	0	0	50	0	50	100
14	SUGAR FACTORY PRACTICESS	SMF301	FSFP	3	-	0	4	4	0	0	50*	25*	25	100
15	BASIC SUGAR MANU.	SMF 303	FBSM	3	-	3	3	6	80	20	25*	0	25	150
16	MECH FLUD FLOW OPERATION	SMF 306	FMFO	3	-	3	2	5	80	20	0	25	25	150
17	**Elective-1 (ALLIED)**	**<One from list >**												
	CHEM PROS TECH.	SMF 308	FCPT	3	-	3	2	5	80	20	0	25	25	150
	BASIC ELECT ENGG	SMF 309	FBEE	3	-	3	2	5	80	20	0	25	25	150
	APPLIED MATH	SMF 310	FAMT	3	-	3	2	5	80	20	0	25	25	150
	BASIC CIVIL ENGG	SMF 311	FBCE	3		3	2	5	80	20	0	25	25	150
						10	15	25	240	60	125	75	150	**650**
	Semester 4													
18	BASIC SUGAR ENGG	SMF 302	FBSE	3	-	4	2	6	80	20	0	25*	25	150
19	SUG FACT. EQUIPT	SMF 305	FSFE	3	-	3	4	7	80	20	25*	0	25	150
20	MASS & HEAT TRANSFER	SMF 307	FMHT	3	-	3	2	5	80	20	0	25	25	150
21	SUGAR MANU.-I	SMF 402	FSUM-I	4	-	3	3	6	80	20	25*	0	25	150
22	BY PROD OF SUGAR INDUSTRY	SMF 404	FBPS	4	-	2	2	4	80	20	-	25*	25	150
23	CAPACITY DESIGN & CALCULATION	SMF 406	FCDC	4	-	4	2	6	80	20	25*	0	25	150
24	COMPUTER APPLICAN	SMF 407	FCOA*	4	-	0	4	4	0	0	25	0	25	50
						19	19	38	480	120	100	75	175	**950**

Sr No	Name of Course	Course Code	Course Abbvn	LVL	PRE REQ	Teach. Scheme (Hrs/week)			Examination Scheme (Marks)					
						TH	PR/TT/DR	CR	TH	TS	PR	OR	TW	TOT
	Semester 5													
25	SUGAR ENGINEERING	SMF 401	FSUE	4	SME302	2	2	4	80	20	0	25*	25	150
26	SUGAR MANUFACTURING - II	SMF 403	FSUM-II	4	SME402	3	3	6	80	20	25*	0	25	150
27	SUGAR CHEM CONTRL	SMF 405	FSCC	4	-	2	2	4	80	20	0	25	25	150
28	**Elective 2 (One from list)**													
	SUGAR FACT. MAINT.	SMF 408	FSFM	4	-	2	4	6	80	20	0	25*	25	150
	INDUSTRIAL ENGG	SMF 409	FINE	4	-	2	4	6	80	20	0	25*	25	150
	PLANT MAINT ENGG	SMF 410	FPME	4	-	2	4	6	80	20	0	25*	25	150
29	IND. ORG. &. MANGMNT	CCF 501	FIOM	5	-	3	0	3	80	20	0	0	0	100
30	**Elective 3 (One from list)**													
	COGENRATION TECH	SMF 504	FCGT	5	-	3	2	5	80	20	0	25*	25	150
	ALCOHOL TECH	SMF 505	FALT	5	-	3	2	5	80	20	0	25*	25	150
	ENERGY CONSERVATION &AUDIT	SMF506	FECA	5	-	3	2	5	80	20	0	25*	25	150
						15	13	28	480	120	25	100	125	**850**
	Semester 6													
31	PROFESSIONAL PRACTICES	CCF 203	FPRP	2	-	1	2	3	0	0	0	50	25	75
32	SEMINAR	SMF 502	FSEM	5	-	0	2	2	0	0	0	25	25	50
33	INPLANT TRAINING	SMF 503	FIT	5	SMF403 SMF 405 SMF 406	0	28	28	00	PST 50	WR 50	50*	50	200
	Note: - PST = 2 tests (Each 25 Marks), WR = Weekly Report, TW = Project Report.													
						01	32	33	100	0	25	100	100	**325**

Path-2 : Students admitted directly to Second Year with XII Science (PCM/PCMB/PCB)/XII Science (Technical)/XII Vocational/ XII MCVC & with ITI

SN	Name of Course	Course Code	Course Abbvn	LVL	PRE REQ	Teach. Scheme (Hrs/week)			Examination Scheme (Marks)					
						TH	PR/TT/DR	CR	TH	TS	PR	OR	TW	TOT
	Semester 3													
1	C- PROGRAMMING	SMF 205	FCOP	2	-	1	4	5	0	0	50	0	50	100
2	SUGAR FACTORY PRACTICESS	SMF301	FSFP	3	-	0	4	4	0	0	50*	25*	25	100
3	BASIC SUGAR MANU	SMF 303	FBSM	3	-	3	3	6	80	20	25*	0	25	150
4	MECH FLUD FLOW OPERATION	SMF 306	FMFO	3	-	3	2	5	80	20	0	25	25	150
5	**Elective-1 (ALLIED)**	**<One from list >**												
	CHEM PROS TECH.	SMF308	FCPT	3	-	3	2	5	80	20	0	25	25	150
	BASIC ELECT ENGG	SMF309	FBEE	3	-	3	2	5	80	20	0	25	25	150
	APPLIED MATH	SMF310	FAMT	3	-	3	2	5	80	20	0	25	25	150
	BASIC CIVIL ENGG	SMF 311	FBCE	3		3	2	5	80	20	0	25	25	150
						10	15	25	240	60	125	75	150	**650**
	Semester 4													
6	BASIC SUGAR ENGG	SMF 302	FBSE	3	-	4	2	6	80	20	0	25*	25	150
7	SUG FACT. EQUIPT	SMF 305	FSFE	3	-	3	4	7	80	20	25*	0	25	150
8	MASS & HEAT TRANSFER	SMF 307	FMHT	3	-	3	2	5	80	20	0	25	25	150
9	SUGAR MANU.-I	SMF 402	FSUM-I	4	-	3	3	6	80	20	25*	0	25	150
10	BY PROD OF SUGAR INDUSTRY	SMF 404	FBPS	4	-	2	2	4	80	20	-	25*	25	150
11	CAPACITY DESIGN & CALCULATION	SMF 406	FCDC	4	-	4	2	6	80	20	25*	0	25	150
12	COMPUTER APPLICAN	SMF 407	FCOA*	4	-	0	4	4	0	0	25	0	25	50
						19	19	38	480	120	100	75	175	**950**

SN	Name of Course	Course Code	Course Abbvn	LVL	PRE REQ	Teach. Scheme (Hrs/week)			Examination Scheme (Marks)					
						TH	PR/TT/DR	CR	TH	TS	PR	OR	TW	TOT
	Semester 5													
13	SUGAR ENGINEERING	SMF 401	FSUE	4	SME302	2	2	4	80	20	0	25*	25	150
14	SUGAR MANUFACTURING - II	SMF 403	FSUM-II	4	SME402	3	3	6	80	20	25*	0	25	150
15	SUGAR CHEM CONTRL	SMF 405	FSCC	4	-	2	2	4	80	20	0	25	25	150
16	**Elective 2 One**	**From list**												
	SUGAR FACT. MAINT.	SMF 408	FSFM	4	-	2	4	6	80	20	0	25*	25	150
	INDUSTRIAL ENGG	SMF 409	FINE	4	-	2	4	6	80	20	0	25*	25	150
	PLANT MAINT ENGG	SMF 410	FPME	4	-	2	4	6	80	20	0	25*	25	150
17	IND.ORG. & MANGMNT	CCF 501	FIOM	5	-	3	0	3	80	20	0	0	0	100
18	**Elective 3 One**	**From list:**												
	COGENRATION TECH	SMF 504	FCGT	5	-	3	2	5	80	20	0	25*	25	150
	ALCOHOL TECH	SMF 505	FALT	5	-	3	2	5	80	20	0	25*	25	150
	ENERGY CONSERVATION &AUDIT	SMF506	FECA	5	-	3	2	5	80	20	0	25*	25	150
						15	13	28	480	120	25	100	125	**850**
	Semester 6													
31	PROFESSIONAL PRACTICES	CCF 203	FPRP	2	-	1	2	3	0	0	0	50	25	75
32	SEMINAR	SMF 502	FSEM	5	-	0	2	2	0	0	0	25	25	50
33	INPLANT TRAINING	SMF 503	FIT	5	SMF403 SMF 405 SMF 406	0	28	28	00	PST 50	WR 50	50*	50	200
	Note: - PST = 2 tests (Each 25 Marks), WR = Weekly Report, TW = Project Report.													
						01	32	33	100	0	25	100	100	**325**

6. EXEMPTIONS FOR COURSES

Eligibility for Exemptions for First and Second Semester Courses of MPECS-2016 for students admitted on X-pass basis

SN	Name of Course	Course Code	Whether eligible for exemption? (Yes / No)				
			XII Science	XII Tech.	XII MCVC	XII Voc.	ITI
1	Engineering Physics (CE/ME/SM/MT)	CCF101	**YES**	**YES**	**YES**	**YES**	YES
2	Engineering Chemistry (CE/ME/SM/MT)	CCF103	**YES**	**YES**	**YES**	**YES**	**YES**
3	Basic Mathematics	CCF105	**YES**	**YES**	**YES**	**YES**	**YES**
4	Engineering Mathematics	CCF106	**YES**	**YES**	**YES**	**YES**	**YES**
5	Engineering Drawing-1(SM)	CCF117	**YES**	**YES**	**YES**	**YES**	**YES**
6	Engineering Drawing -2 (CE/ME/SM/MT)	CCF108	**YES**	**YES**	**YES**	**YES**	**YES**
7	Applied Mechanics	CCF110	**YES**	**YES**	**YES**	**YES**	**YES**
8	Workshop Practices–1 (ME, SM, MT)	CCF112	**YES**	**YES**	**YES**	**YES**	**YES**
9	Workshop Practices -2 (ME, SM, MT)	CCF116	**YES**	**YES**	**YES**	**YES**	**YES**
10	Generic Skills	CCF201	**YES**	**YES**	**YES**	**YES**	**YES**
11	Communication Skills	CCF202	**YES**	**YES**	**YES**	**YES**	**YES**
12	Introduction to Sugar Manufacturing	SMF304	**YES**	**YES**	**YES**	**YES**	**YES**

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.

****Direct Second year admitted student have no backlog subject from semester I&II. ****

7. COURSE EQUIVALENCE FOR PREVIOUS MPECSs

MPECS 2001	MPECS 2006	MPECS 2010	MPECS 2013	MPECS 2016
0103 Applied physics-I	R103 Applied Physics-I	X 102 Basic Physics	CCE101 Engineering Physics	CCF101 Engineering Physics
0104 Applied physics –II	R104 Applied Physics –II	X 108 Applied Physics		
0105 applied Chemistry-I	R105 Applied Chemistry-I	X 103 Applied Chemistry	CCE103 Engineering Chemistry	CCF103 Engineering Chemistry
0106 applied Chemistry-II	R106 Chemistry Of Engineering Materials.	X 109 Chemistry of Engineering Materials		
0107 Mathematics-I	R107 Basic Mathematics.	X 104 Basic Mathematics	CCE105 Basic Mathematics	CCF105 Basic Mathematics
0108 Mathematics-II	R108 Engineering Mathematics.	XC 110 Engineering Mathematics	CCE106 Engineering Mathematics	CCF106 Engineering Mathematics
0116 Applied Mechanics	R112 Applied Mechanics.	X 111 Applied Mechanics	CCE110 Applied Mechanics	CCF110 Applied Mechanics
0109 Engineering Drawing-I	R109 Engineering Drawing-I	X 105 Engineering Drawing-I	CCE 117 Engineering Drawing-I	CCF 117 Engineering Drawing-I
0110 Engineering Drawing-II	R110 Engineering Drawing-II	X 107 Engineering Drawing-II	CCE108 Engineering Drawing-II	CCF108 Engineering Drawing-II
0113 Workshop –I	R113 Workshop Practice –I	SM 101 Basic Workshop Practice (Mechanical)	CCE112 Workshop Practice -I	CCF112 Workshop Practice -I
0114 Workshop –I	R114 Workshop Practice –II	SM 102 Workshop Practice (Mechanical)	CCE116 Workshop Practice -II	CCF116 Workshop Practice -II
0101 Communication skill –I	R101 Communication Skill	X 101 Generic Skills	CCE201 Generic Skills	CCF201 Generic Skills
102 Communication skill -II	R102 Generic Skill.	X 106 Communication Skills	CCE202 Communication Skills	CCF202 Communication Skills

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5401 C Programming	S401 C Programming	SM401 Computer Programming	SME205 C-Programming	SMF205 C-Programming
				SMF301 Sugar factory Practices
5202 Thermal Engineering	S202 Thermal Engineering	SM202 Basic Sugar Engineering	SME302 Basic Sugar Engineering	SMF302 Basic Sugar Engineering
5306 Sugar Chemistry	S204 Sugar Manufacturing-I	SM203 Sugar technology-I	SME303 Basic Sugar Technology	SMF303 Basic Sugar Manufacturing
O225 Basic Sugar Manufacturing.	R225 Basic Sugar Manufacturing.	Eliminated	SME304 Introduction To Sugar Manuf.	SMF304 Introduction To Sugar Manuf.
5206 Sugar Factory Equip. & Maint.	S206 Sugar Factory Equip. & Maint.	SM205 Sugar Factory Equip. & Maint.	SME305 Sugar Factory Equip.	SMF305 Sugar Factory Equip.
5207 Unit Operation-I	S207 Mech. & Fluid Flow Operations	SM206 Mechanical & Fluid Flow Operations	SME306 Mechanical Fluid Flow Operations	SMF306 Mechanical Fluid Flow Operations
5210 Heat Transfer	S307 Mass and Heat Transfer Operations	SM307 Mass and Heat Transfer Operations	SME307 Mass and Heat Transfer Operations	SMF307 Mass and Heat Transfer Operations
5204 Chemical Process Technology	S208 Chemical Process Technology	SM 208 Chemical Process Technology	SME308 Chemical process Technology	SMF308 Chemical process Technology
O222 Elect. Circuit & Machines	R222 Electrical Wiring & Estimating	Eliminated	SME309 Basic Electrical Engg	SMF309 Basic Electrical Engg
5201 Mathematics-III	S201 Mathematics-III	SM201 Applied Mathematics	SME301 Applied mathematics	SMF310 Applied Mathematics
O221 Elements of Civil Engg	R221 Elements Of Civil Engg	SM 210 Basic Civil Engg	SME 310 Basic Civil Engg	SMF 311 Basic Civil Engg
		SM 301 Sugar Engineering	SME401 Sugar Engineering	SMF401 Sugar Engineering
5205 Sugar	S204 Sugar	SM203 Sugar	SME402 Sugar	SMF402 Sugar

Technology	manufacturing-II	Technology-II	Technology-I	Manufacturing-I
5303 Theory of Pan Boiling	S302 Sugar Manufacturing-III	SM 303 Sugar Technology -III	SME403 Sugar Technology-II	SMF403 Sugar Manufacturing-II
5308 Byproducts of Sugar Industry	S305 Byproducts of Sugar Industry	SM305 Byproducts of Sugar Industry	SME404 Byproducts of Sugar Industry	SMF404 Byproducts of Sugar Industry
5208 Chemical Control	S306 Sugar Chemical Control	SM306 Sugar Chemical Control	SME405 Sugar Chemical Control	SMF405 Sugar Chemical Control
			SME406 Capacity Design & Calculation	SMF406 Capacity Design & Calculation
5402 Computer Application	S402 Computer Application	SM402 Computer Application	SME407 Computer Application	SMF407 Computer Application
			SME408 Sugar Factory Maintenance	SMF408 Sugar Factory Maintenance
			SME409 Industrial Engineering	SMF409 Industrial Engineering
			SME410 Plant Maintenance Engineering	SMF410 Plant Maintenance Engineering
5305 Seminar	S304 Seminar	SM303 Seminar	SME501 Seminar	SMF502 Seminar
5404 In-Plant Training	S404 Sugar Industry In-plant Training	SM403 Sugar Industry In-plant Training	SME502 Sugar Industry In-plant Training	SMF503 In-plant Training
5403 Industrial Organization And Management	S403 Industrial Organization And Management	SM403 Industrial Organization And Management	SME503 Sugar Industrial Management	CCF501 Sugar Industrial Management
			SME506 Cogeneration Technology	SMF504 Cogeneration Technology
			SME507 Alcohol Technology	SMF505 Alcohol Technology
			SME508 Paper & Pulp Technology	SMF506 Energy Conservation & Audit
0111	Eliminated	----	----	----

Fundamentals of Engineering-I				
0112 Fundamentals of Engineering-I	Eliminated	----	----	----
0115 Introduction to Computer	R111 Computer Fundamentals & Application	Eliminated		
--------	--------	--------	CCE204 Environmental Studies	Eliminated
5203 Machine Drawing	S203 Machine Drawing	ME203 Machine Drawing	Eliminated	Eliminated
5209 Electrical Technology	S209 Electrical Technology	SM207 Electrical Technology	Eliminated	Eliminated
Newly Introduced	S210 Personality Development	ME211 Personality Development.	Eliminated	Eliminated
		SM204 Factory Practice-I	Eliminated	Eliminated
5211 Strength of Materials	Eliminated	-----	-----	-----
5212 Fabrication Technology.	S409 Fabrication Technology	Eliminated	-----	-----
O223 Basic Electronics.	R223 Basic Electronics	Eliminated	-------	-------
O224 Mechanical Maintenance Engg.	R224 Basic Mechanical Engineering	Eliminated	-------	-------
O226 Pollution Control	R226 Environmental Pollution & Protection	SM 211 Pollution Control	Eliminated	-------
O227 Non-Conventional Energy Sources.	R227 Non-Conventional Energy Sources	SM 212 Non-Conventional Energy Sources	Eliminated	-------
O228 Higher Mathematics	R228 Higher Mathematics	SM 213 Higher Mathematics	Eliminated	-------

5301 Power Engineering	S301 Power Engineering	ME301Power Engineering	Eliminated	-------
5302 Unit Operation-II	Eliminated			-------
	S308 Career & Entrepreneurship Development	Eliminated	-------	-------
		SM 308 Factory Practice – II	Eliminated	-------
5304 Plant Maintenance Engg.	S407 Material Management	Eliminated	SME504 Material management	Eliminated
			SME505 Quality System Management	Eliminated

8. PROFORMAS FOR EVALUATION OF TERM WORK, ORALS AND PRACTICAL

PROFORMA - I

GOVERNMENT POLYTECHNIC, KOLHAPUR

Performance for Final Assessment of ORAL / PRACTICAL

By Internal & External Examiner

(For subject having ONLY ORAL / PRACTICAL)

Course Code & Course Name -- _____

Programme - _____

Summer / Winter Exam - _____ Date - _____

Roll No / Exam No	Marks of Progressive Skill Test	Marks of Continuous Assessment	Performance of Term End OR/PR by Internal Examiner	Performance of Term End OR/PR by External Examiner	Marks out of	Marks as per Evaluation Scheme
	25	25	25	25	100	

Name and Signature of Internal Examiner **Name and Signature of External Examiner**

PROFORMA – II
GOVERNMENT POLYTECHNIC, KOLHAPUR
Performance for Final Assessment of ORAL / PRACTICAL
By Internal Examiner

(For subject having ONLY ORAL / PRACTICAL)

Course Code & Course Name -- _____ _____

Programme - _____

Summer / Winter Exam - _____ Date - _____

Roll No / Exam No	Marks of Progressive Skill Test	Marks of Continuous Assessment	Performance of Term End OR/PR by Internal Examiner	Marks out of	Marks as per Evaluation Scheme
	25	25	50	100	

Name and Signature of Internal Examiner

PROFORMA – III

GOVERNMENT POLYTECHNIC, KOLHAPUR

Performance for Final Assessment of TERMWORK

By Internal Examiner

(For subject having ONLY TERMWORK)

Course Code & Course Name -- _____

Programme - _____

Summer / Winter Exam - _____Date - _____

Roll No / Exam No	Marks of Progressive Skill Test	Marks of Continuous Assessment	Marks out of	Marks as per Evaluation Scheme
	50	50	100	

Name and Signature of Internal Examine

PROFORMA – IV

GOVERNMENT POLYTECHNIC, KOLHAPUR

Performance for Final Assessment of ORAL / PRACTICAL

By Internal & External Examiner

(For subject having ORAL / PR & TW)

Course Code & Course Name -- _____

Programme - _____

Summer / Winter Exam - _____ Date - _____

Roll No / Exam No	Marks of Progressive Skill Test	Performance of Term End OR/PR by Internal Examiner	Performance of Term End OR/PR by External Examiner	Marks out of	Marks as per Evaluation Scheme
	25	25	50	100	

Name and Signature of Internal Examiner

Name and Signature of External Examiner

PROFORMA – V

GOVERNMENT POLYTECHNIC, KOLHAPUR

Performance for Final Assessment of ORAL / PRACTICAL

By Internal Examiner

(For subject having ORAL / PR & TW)

Course Code & Course Name -- _____

Programme - _____

Summer / Winter Exam - _____ Date - _____

Roll No / Exam No	Marks of Progressive Skill Test	Performance of Term End OR/PR by Internal Examiner	Marks out of	Marks as per Evaluation Scheme
	50	50	100	

Name and Signature of Internal Examiner

PROFORMA – VI
GOVERNMENT POLYTECHNIC, KOLHAPUR
Performance for Final Assessment of TERMWORK
By Internal Examiner
(For subject having ORAL / PR & TW)

Course Code & Course Name -- _____

Programme - _____

Summer / Winter Exam - _____ Date - _____

Roll No / Exam No	Marks of Continuous Assessment	Marks out of	Marks as per Evaluation Scheme
	100	100	

Name and Signature of Internal Examiner

SECTION – II

SYLLABI OF COURSES (LEVEL-WISE)

LEVEL – I

COURSE **ID :**

Course Name : ENGINEERING PHYSICS (CE/ME/SM/MT)
Course Code : CCF101
Course Abbreviation : FPHA

TEACHING AND EVALUATION SCHEME:

Pre-requisite Course(s) : Nil
Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	04	06
Practical	02	

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	20	--	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 :

CCF101-1 Select proper material in engineering industry by analysis of its physical properties
CCF101-2 Use basic principles of wave motion for related engineering applications
CCF101-3 Use nanotechnology for quality improvement of materials
CCF101-4 Apply principles of optics, electricity to solve engineering problems
CCF101-5 Use LASERs, X-rays and photocell based equipments
CCF101-6 Apply principles of acoustics and ultrasonic 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	Programme Outcomes POs and PSOs											
	PO 1 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan & Organize**	**PSO2 Production & Management**
Competency: Apply principles of Physics to solve engineering problems.	3	1	2	1	2	1	-	2	1	2	1	1
CCF101-1 Select proper material in engineering industry by analysis of its physical properties	3	1	2	1	1	1	-	1	1	2	1	1
CCF101-2 Use basic principles of wave motion for related engineering applications	2	1	2	-	1	1	-	2	1	2	1	1
CCF101-3 Use nanotechnology for quality improvement of materials	3	1	1	-	2	2	-	-	1	2	1	1
CCF101-4 Apply principles of optics, electricity to solve engineering problems	3	1	3	1	2	2	-	2	1	2	1	1
CCF101-5 Use LASERs, X-rays and photocell based equipments	3	1	2	1	2	1	-	1	1	2	1	1
CCF101-6 Apply principles of acoustics and ultrasonics for related engineering applications	3	1	2	1	2	1	-	1	1	2	1	1

CONTENT :

i) THEORY :

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome CCF101-1 *Select proper material in engineering industry by analysis of its physical properties*			
1	**ELASTICITY** 1.1 Definitions of elasticity, plasticity, rigidity, deforming force, restoring force 1.2 Stress, Strain and their types 1.3 Elastic Limit, Statement of Hooke's law, modulus of elasticity and its types 1.4 Behavior of wire under continuously increasing load- yield point, ultimate stress, breaking stress 1.5 Factor of safety 1.6 Applications of elasticity 1.7 **Numerical problems**	**06**	**08**
2	**PROPERTIES OF LIQUID** **2.1 INTRODUCTION** Definitions of density, specific volume, specific weight, specific gravity, compressibility of liquid **2.2 VISCOSITY** 2.2.1 Definition and meaning of viscosity, velocity gradient 2.2.2 Newton's law of viscosity, Coefficient of viscosity 2.2.3 Stokes law (Derivation not required) 2.2.4 Derivation of expression for coefficient of viscosity of liquid by Stokes method 2.2.5 Applications of viscosity. **2.3 SURFACE TENSION** 2.3.1 Definition and molecular theory 2.3.2 Angle of contact : definition and significance 2.3.3 Capillary action : definition and examples 2.3.4 Derivation of expression for surface tension by capillary rise method (experiment not required) 2.3.5 Effect of temperature and impurity on surface tension 2.3.6 Applications of surface tension **No numericals on above topic**	**16** (02) (06) (08)	**18** (02) (06) (10)

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome CCF101-2 *Use basic principles of wave motion for related engineering applications*			
3	**WAVE MOTION** 3.1 Definitions of periodic motion, Linear S. H. M. 3.2 Parameters of linear SHM : Amplitudes, Period, Frequency and Phase 3.3 Characteristics of linear SHM 3.4 Concept and definition of wave 3.5 Parameters of wave- Frequency, periodic time, phase and wavelength 3.6 Types of waves (transverse and longitudinal) and their characteristics 3.7 Free and forced oscillations 3.8 Phenomenon of resonance and its applications **No numericals on above topic**	**06**	**08**
Course Outcome CCF101-3 *Use nanotechnology for quality improvement of materials*			
4	**INTRODUCTION TO NANOTECHNOLOGY** 4.1 Definition of nanoscale, nanometer, nanoparticle 4.2 Definition and examples of nanostructured materials 4.3 Applications of nanotechnology in electronics, automobile, textile, space, medicine, cosmetics and environment **No numericals on above topic**	**04**	**06**
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)
Course Outcome CCF101-4 *Apply principles of optics, electricity to solve engineering problems*			
5	**PROPERTIES OF LIGHT** 5.1 Refraction of light 5.2 Laws of Refraction of Light, Snell's law 5.3 Refraction through glass prism 5.4 Derivation of prism formula 5.5 Dispersion & Dispersive Power 5.6 **Numerical problems**	**06**	**06**
6	**ELECTRICITY** 6.1 Concept of electric current , resistance 6.2 Ohm's law, Specific resistance 6.3 Resistances in series and parallel. 6.4 Wheatstone's Network and Meter Bridge. 6.5 **Numerical problems**	**06**	**08**
Course Outcome CCF101-5 *Use LASERs, X-rays and photocell based equipments*			
7	**MODERN PHYSICS** **7.1 PHOTO ELECTRIC EFFECT** 7.1.1 Plank's hypothesis 7.1.2 Photon and its characteristics 7.1.3 Photo electric effect and its characteristics 7.1.4 Plank-Einstein equation 7.1.5 Photocell – construction and symbol 7.1.6 Applications of photo electric effect 7.1.7 **Numerical Problems** **7.2 LASER** 7.2.1 Introduction of LASER 7.2.2 Properties of laser 7.2.3 Spontaneous and stimulated emission 7.2.4 Population inversion and optical pumping 7.2.5 Applications of LASER **No numericals on above topic** **7.3 X-RAYS** 7.3.1 Nature and properties of x-rays. 7.3.2 Production of x-rays by Coolidge tube 7.3.3 Applications of x-rays **No numericals on above topic**	**14** (06) (04) (04)	**18** (08) (06) (04)

Sr. No.	Topics / Subtopics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome CCF101-6 *Apply principles of acoustics and ultrasonics for related engineering applications*			
8	**ACOUSTICS AND ULTRASONICS** **8.1 ACOUSTICS** 8.1.1 Echo and reverberation of sound 8.1.2 Sabine's formula 8.1.3 Requirements of good acoustics 8.1.4 Acoustical planning of an auditorium 8.1.5 **Numerical Problems** **8.2 ULTRASONICS** 8.2.1 Limits of audibility 8.2.2 Ultrasonic waves 8.2.3 Ultrasonic transducers : Piezoelectric and Magnetostriction 8.2.4 Applications of ultrasonic waves **No numericals on above topic**	**06**	**08**
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	Elasticity	2	4	2	CCF101-1	08
I/2	Properties of liquids	10	6	2	CCF101-1	18
I/3	Wave motion	4	2	2	CCF101-2	08
I/4	Nanotechnology	2	4	-	CCF101-3	06
II/5	Properties of light	2	2	2	CCF101-4	06
II/6	Electricity	2	2	4	CCF101-4	08
II/7	Modern Physics	8	8	2	CCF101-5	18
II/8	Acoustics and Ultrasonics	2	4	2	CCF101-6	08
	Total	32	32	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.

ii) **TERM WORK** Term work shall consist of the following :

Laboratory experiments and related skills to be developed :

Sr. No.	Title of Experiment	Skills to be developed	Course Outcome
1	Overview of Field Applications of Physics	**a)** Information search **b)** Information presentation	CCF101-1 To CCF101-6
(Any 10 of the following experiments)			
2	To measure dimensions of given objects by using Vernier Caliper	i) Determine least count and zero error in the measuring instrument. ii) Measuring internal and external dimensions of given objects iii) Handling the measuring instruments for measuring depth, thickness etc. iv) Tabulating observations.	CCF101-1
3	To measure the diameter of bob and thickness of plate by using Micrometer screw gauge	i) Determine least count and zero error in the measuring instrument. ii) Measuring dimensions of given objects iii) Handling the measuring instruments for measuring depth, thickness etc. iv) Tabulating observations.	CCF101-1
4	To determine the viscosity of liquid by Stokes method.	i) Measuring diameter of steel ball using micrometer screw gauge. ii) Measuring terminal velocity of steel ball in the liquid column. iii) Use of stop watch for measurement of time. iv) Tabulating observations.	CCF101-1
5	To determine the surface tension of liquid by capillary rise method	i) Focusing the microscope properly in order to get clear image. ii) Adjusting cross wires of microscope at particular place. iii) Taking readings for main scale and Vernier scale of traveling microscope. iv) Tabulating observations.	CCF101-1
6	To measure unknown resistance of wire by Ammeter – Voltmeter method.	i) Drawing the circuit diagram of the required experiment. ii) Connecting the instruments as per circuit diagram. iii) Measuring the value of potential difference & current in the circuit. iv) Tabulating observations.	CCF101-4
7	To verify Snell's law using glass slab	i) Drawing necessary ray diagram ii) Measuring angles of incidence and refraction iii) Tabulating observations.	CCF101-4
8	To determine refractive index of prism by pin method	i) Removing parallax between the imag and the pins by observing the refracted r through a prism. ii) Measuring the angle of refraction correctl	CCF101-4

		iii)Drawing the path of refracted ray throu the prism iv)Drawing inference regarding relati between angle of incidence & angle refraction from i-δ graph v) Tabulating observations.	
9	To determine velocity of sound by resonance tube	i) Adjusting the resonating length by discriminating resonating sound from sound produced by the tuning fork. ii) Measuring internal diameter of resonating tube using vernier caliper iii) Drawing inference & confirming Law nL = constant iv) Tabulating observations.	CCF101-2
10	To study characteristics of photocell	i) Drawing circuit diagram ii) Handling different delicate instruments. iii)Tabulating observations iv)Drawing graph	CCF101-5
11	To determine the acceleration due to gravity by 'g' by simple pendulum	i) Measuring length of pendulum ii) Finding least count of stopwatch iii)Measuring periodic time with the help of stop watch iv) Tabulating observations.	CCF101-2
12	To measure unknown resistance by Wheatstone's meter bridge.	i) Drawing the circuit diagram for series connections of the resistances. ii) Connecting the resistances for series method as per circuit diagram. iii) Finding the correct position of null point & measuring correct balancing lenses on Meter bridge. iv)Tabulating observations.	CCF101-4

C) INDUSTRIAL EXPOSURE

Sr. No.	Mode of Exposure (Visit/Exp.Lect/Ind.Survey/…)	Topic
1.	Field applications in theory lectures in every topic	All topics in course syllabus
2.	Practical exercise on overview of field applications of Physics	Part of term work

Report of each Industrial Exposure Activity shall be submitted by student as a part of term work for evaluation.

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

5 Assessment Criteria for Term 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 Decency and presentation	5
TOTAL		**25**

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 Term Work	05
	Total	25

6 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

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

Sr. No.	Author	Title	Publisher
1.	B.G. Bhandarkar	Applied Physics	Nirali publications
2.	Manikpure – Deshpande	Applied Physics	S. Chand publications
3	Narkhede, Pawar, Sutar	Applied Science	Nirali publications
4	Shelake, Shinde, Adwankar	Applied Science	Vision publications
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/

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COURSE ID :

Course Name : CHEMISTRY OF ENGINEERING MATERIALS
Course Code : CCF103
Course Abbreviation : FCHA

TEACHING AND EVALUATION SCHEME :

Pre-requisite Course(s) : <course name and code>
Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	04	06
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	50*	150

* Assessment as per pro-forma II.

RATIONALE :

Basic science such as Chemistry is the foundation 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 and Properties of the materials, which form the core of the fundamental sciences. Many Processes are based on principles of Chemistry in various s industries. Topics such as water, Electrochemistry, Corrosion and protection of metals from corrosion, are some of the direct applications of chemistry in engineering. Hencethe knowledge of chemistry is essential to the aspiring engineers of all branches in their field.Engineering materials like Steels, Rubber, Plastic, Thermocole, Glass wool, Adhesive, Paints, Lubricants are the backbone of various industries, machines, equipment, & processes.

COMPETANCY :

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's & chemicals handling.

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

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COPURSE OUTCOMES :

CCF-103-1 Understand the applications of basic concepts in chemistry.
CCF-103-2 Apply the knowledge of electrochemistry in industry for electroplating & electro refining.
CCF-103-3 Interpret the reasons of corrosion & remedies by using proper techniques.
CCF-103-4 Use relevant water treatment process to solve industrial problems.
CCF-103-5 Applying proper material for specific purpose**.**
CCF-103-6 Apply knowledge of extraction, properties of iron in engineering applications.
CCF-103-7 Study properties of lubricants, polymers, insulators, adhesives, composite materials 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 **]**

Competency and COs	Programme Outcomes POs and PSOs											
	PO 1 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan & Organize	PSO2 Production & Management
Competency: Apply the knowledge of chemistry to use the engineering materials for various purposes depending on their chemical properties.	3	3	3	2	-	1	-	-	-	1	2	2
CCF-103-1 Understand the applications of basic concepts in chemistry**.**	3	3	3	2	-	1	-	-	-	1	2	2
CCF-103-2 Apply the knowledge of electrochemistry in industry for electroplating & electrorefining.	3	3	3	3	1	2	-	-	-	2	2	2
CCF-103-3 Interpret the reasons of corrosion & remedies by using proper techniques**.**	3	3	3	2	-	2	-	-	-	1	3	3
CCF-103-4 Use relevant water treatment process to solve industrial problems.	3	3	3	3	1	2	-	-	-	2	2	3
CCF**-**103-5 Applying proper material for specific purpose**.**	3	2	3	2	2	1	-	-	-	2	2	2
CCF-103-6 Apply knowledge of extraction, properties of iron in engineering applications.	3	2	2	-	2	1	-	-	-	1	2	2
CCF-103-7 Study properties of lubricants, polymers, insulators, adhesives, composite materials for different applications.	3	3	2	2	3	3	-	-	-	3	2	2

CONTENT :

A. THEORY :

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course outcomes CCF103-1 Understand the applications of basic concepts in chemistry.		
1	**ATOMIC STRUCTURE** 8.2 Atom :Fundamental particles, Nature of atom 8.3 Atomic Number, Mass Number, Isotopes and isobars 8.4 Bohr's theory of atom 8.5 Statement of Hund's rule of maximum multiplicity, Pauli's exclusion principle Aufbau's principle 8.6 Rules of distribution of planetary electrons **8.7** Electronic configuration of atoms with atomic number 1-30 8.8 Lewis and Langmuir's concept of stable electronic configuration 8.9 Electovalency and Co-valency 8.10 Formation Of electrovalent compounds- NaCl, MgO **8.11** Formation of Covalent compounds-H_2O,CO_2	**07**	**08**
	Course outcomes CCF103-2 Apply the knowledge of electrochemistry in industry for electroplating & electrorefining.		
2	**ELECTROCHEMISTRY** 2.1 Definitions- Conductor, Electrolyte, Electrode 2.2Difference between metallic conduction and electrolytic conduction 2.3 Distinguish between Atom & Ion 2.4 Arrhenius Theory Of Ionisation 2.5 Degree of Ionisation & Factors affecting degree of ionisation 2.6 Electrolysis of CuSO4 solution by using a) Pt -electrodes b) Cu-electrodes 2.7 Industrial applications of electrolysis 2.7 .1 Electroplating 2.7.2 Electro refining of Metals. 2.8 Faraday's Laws of Electrolysis 2.9 Numerical problems based on Faraday's laws	**07**	**08**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course outcomes CCF103-3 Interpret the reasons of corrosion & remedies by using proper techniques.			
3.	**CORROSION AND PROTECTIVE COATING** 3.1 Definition & types of corrosion 3.2 Dry or Atmospheric corrosion , Oxide Film Formation & its types ,Factors affecting atmospheric corrosion 3.3 Wet or electrochemical corrosion 3.4 Factors influencing immersed corrosion 3.5 Methods of protection of metal from corrosion - Hot dipping (Galvanizing & Tinning) ,Metal spraying, Metal cladding, Cementation or sherardizing	**07**	**08**
Course outcomes CCF103-4 Use relevant water treatment process to solve industrial problems.			
4	**WATER** 4.1 Impurities in natural water 4.2 Hard water & Soft water 4.3 Hardness of water- Temporary & Permanent 4.4 Reactions of hard water with soap 4.5 Disadvantages of hard water for domestic & Industrial purpose - Textile Industry, Sugar Industry, Paper Industry Dying Industry 4.6 scale formation in boilers , it's causes, disadvantages & removal of scale 4.7 Sterilization of water - Chlorination –by Cl_2, bleaching powder, chloraamine with chemical reactions 4.8 Ion Exchange method to remove total hardness of water 4.9 pH definition, pH scale , applications of pH in boiler, sugar industry & sewage	**11**	**16**
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 I1

Sr. No.	Topics / Subtopics	Lectures (Hours)	Theory Evaluation (Marks)
Course outcomes CCF-103-5 Applying proper material for specific purpose**.** CCF-103-6 Apply knowledge of extraction, properties of iron in engineering applications.			
5	**METALLURGY & ALLOYS** 5.1 Occurrence of metals , Definition of mineral , ore, flux, Gangue & Slag 5.2 Flow chart of metallurgical processes 5.3 Concentration of ores—Physical Methods - Gravity Separation Method, Electromagnetic separation method, Froth floatation method 3.1 Chemical Methods - Calcination & Roasting . 5.5 Ores of Iron. 8.1 Extraction of Iron from its ore - Blast Furnace—construction, Working ,Reactions, Products. 8.2 Properties & uses of cast iron , wrought Iron and Steel. 8.3 Definition , Classification & Purposes of making alloy 5. 9 Composition, Properties, & Engineering applications of Nonferrous Alloys – Duralumin, Monal metal, Woods metal & Ferrous Alloys -Heat resisting steel , Magnetic steel , Stainless steel	**12**	**12**
Course outcomes CCF-103-7 Study properties of lubricants, polymers, insulators, adhesives, composite materials for different applications.			
6	**LUBRICANTS** 6.1 Definition , Classification & Functions of lubricant. 6.2 Lubrication & it's types - Boundary lubrication, Fluid film lubrication ,Extreme pressure lubrication 6.3 Characteristics of lubricants Viscosity, Viscosity index, Oiliness, Volatility, cloud & pour point, Flash & fire point, Acid Value, 6.4 Selection of lubricant for Gears, Cutting tools, , Concrete Mixture machine, sewing machine.	**05**	**06**

CCF-103-5 Applying proper material for specific purpose**.**			
7	**PAINT AND VARNISH** 7.1 Oil Paint -- Definition & characteristics of oil paint 7.2 Purpose of using oil paint 7.3 Ingredients of oil paint with suitable example & its functions - Drying oil (vehicle), Drier, Pigment, Thinner, Filler (extender), Plasticizer 7.4 Varnish – Definition, Types, Constituent, Properties & applications. 6.1 Distinction between paint & varnish 6.2 Water based and solvent base paints.	**05**	**06**
Course outcomes CCF-103-7 Study properties of lubricants, polymers, insulators, adhesives, composite materials for different applications.			
8	**CHEMISTRY OF NONMETALIC ENGINNERING MATERIALS** **8.1 INSULATORS** 8.4.1 Definition & Characteristics of good insulator 8.4.2 Preparation , Properties & uses of - Glass wool & Thermocole **8.2 ADHESIVES** 8.2.1 Definition of Adhesives 8.2.2 Characteristics of good Adhesives 5.4.1 Properties & uses of Adhesives. **5.5 COMPOSITE MATERIALS** 8.3.1 Definition, Classification ,Properties Applications of Composite materials **5.6 PLASTICS** 8.5.1 Polymer, Polymerization , methods of polymerization- Addition & condensation 8.4.2 Classification of plastics -Thermo-softening plastic &Thermosetting plastics. 8.4.3 Engineering properties & applications of plastic 8.5 **RUBBER** 8.5.1 Elastomer , Natural Rubber & Synthetic rubber 8.5.2 Drawbacks of Natural Rubber 8.5.3 Vulcanization of Rubber 8.5.4 Characteristics & related applications of rubber - Tack, Rebound, Elasticity & Abrasion resistance	**10**	**16**
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			Course out come	Total marks
		Remember	Understand	Application		
I / 1	Atomic structure	06	02	-	CCF103-1	08
I / 2	Electrochemistry	02	02	04	CCF103-3	08
I / 3	Corrosion &protective coating	04	02	02	CCF103-5	08
I / 4	Water	08	04	04	CCF103-6	16
II/5	Metallurgy & Alloys	06	06	06	CCF-103-3& CCF-103-4	18
II/6	Lubricants	04	02	02	CCF-103-4	06
II/7	Paint & Varnish	02	02	02	CCF-103-1	06
II/8	Chemistry of nonmetallic engg. materials	04	02	04	CCF-103-4	10
	Total					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.

B. **TERM WORK** Term work shall consist of the following :

i) Laboratory experiments and related skills to be developed :

Sr. No.	Title of Experiment	Skills to be developed	Course Outcomes
1	Introduction to Chemistry laboratory	Awareness of chemicals ,glasswares &instruments used in chemistry laboratory	CCF-103-1 to CCF-103-7
2	Preparation of 1 N, 0.5 N & 0.1 N NaOH, HCI, Oxalic acid, $FeSO_4$, etc.	Skill of weighing , handling Glassware & measuring Solutions	CCF-103-1
3	Titration of strong acid and strong base. (HCl X NaOH)	Skills of determining accurate end point of titration & development of measurement skills.	CCF-103-1
4	Titration of strong acid,strong base& weak acid (HCI X NaOH X $H_2C_2O_4.H_2O$	Skills of determining accurate end point of titration & development of measurement skills.	CCF-103-1
5	Titration of weak base , strong acid & strong base (Na_2CO_3X H_2SO_4 X KOH	Skills of determining accurate end point of titration & development of measurement skills.	CCF-103-1
6	Estimation of chloride content in water by Mohr' s method	Measurement skill utilization of practical data for testing & estimation	CCF-103-3
7	Determination of hardness of water by E.D.T.A method	Measurement skill utilization of practical data for testing & estimation	CCF-103-4
8	Determination of viscosity of oil by Ostwald's viscometer	Measurement skill utilization of practical data for testing & estimation	CCF-103-7
9	Estimation of Ca in limestone.	Measurement skill utilization of practical data for testing & estimation	CCF-103-1
10	Estimation of % of Fe in given sample of steel	Measurement skill utilization of practical data for testing & estimation	CCF-103-1

1. Assessment criteria for Practical Work :

2. Continuous Assessment of Practical Assignments:

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

Domain	Particulars	Marks out of 50
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
	Decency and presentation	-
TOTAL		**25**

ii) Progressive Skills Test :

Criteria for 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 Term Work	05
	Total	25

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

iii) Industrial Exposure :

Sr. No.	Mode of Exposure (Visit/Exp.Lect/Ind.Survey/…)	Topic
1.		
2.		
…		

Report of each Industrial Exposure Activity shall be submitted by student as a part of term work for evaluation.

INSTRUCTIONAL STRATEGIES :

InstructionalMethods :

1. Lectures cum Discussions 2. Regular Home Assignments. 3. …

Teaching and Learning resources:

1. Chalk board 2. O.H.P. 3.Slides 4. Item Bank 5. …

REFERENCE MATERIAL :a) Books / Codes<*at least 5*>

Sr. No.	Author	Title	Publisher
1.	Jain & Jain	Engineering chemistry	Dhanpatrai publishing co.
2.	S. C. Rangawala	Engineering materials	Engineerin 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	Mc Graw Hill publishing company
7.	P. C. Jain	Chemistry of Engineering Materials	
8.	S. S. Dara	A text of Engineering Chemistry	

b) Websites <*at least 3*>

iv) www.substech.com
v) www.kentchemistry.com

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COURSE ID :

Course Name : BASIC MATHEMATICS
Course Code : CCF105
Course Abbreviation : FBMT

TEACHING AND EVALUATION SCHEME:

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

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 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) :

CCF105-1 : To solve simultaneous equations using Cramer's rule.
CCF105-2 : To resolve a given function into partial fractions.
CCF105-3 : To solve simultaneous equations by using inverse of matrix method.
CCF105-4 : To expand any binomial expression for positive integral index.
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	Programme Outcomes POs and PSOs											
	PO 1 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long leaning	PSO1 Plan & Organize	PSO2 Production & Management
Competency	3	2	3	2	-	-	1	2	1	3	1	1
CCF105-1	3	2	2	-	-	-	1	1	1	3	1	1
CCF105-2	3	2	3	-	-	-	1	1	1	3	1	1
CCF105-3.	3	2	3	1	2	-	1	2	3	3	1	1
CCF105-4	3	2	3	1	2	-	1	2	3	3	1	1
CCF105-5	3	2	3	1	2	-	1	2	3	3	1	1

CONTENT :

A) THEORY :

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome CCF105-1 : *To solve simultaneous equations using Cramer's rule*			
1	**Determinants** 1.1 Definition of nth order determinant 1.2 Expansion of second and third order determinants 1.3 To solve simultaneous equations having 3 unknowns using Crammer's Rule 1.4 Consistency of equations using Determinants	**04**	**06**
Course Outcome CCF105-2 : *To resolve a given function into partial fractions*			
2	**Partial Fractions** 2.1 Definition of rational, proper and improper fractions 2.2 Various cases of Partial fractions and Examples	**06**	**12**
Course Outcome CCF105-3 : *To solve simultaneous equations by using inverse of matrix method*			
3	**Matrices** 3.1 Definition of a matrix, Types of matrices 3.2 Algebra of matrices 3.3 Equality of two matrices, Transpose of a matrix 3.4 Minor and Co-factor of an element of a matrix 3.5 Adjoint and Inverse of a matrix 3.6 Solution of simultaneous equations by Inverse of a matrix method	**10**	**16**
Course Outcome CCF105-4 : *To expand any binomial expression for positive integral index.*			
4	**Binomial Theorem** 4.1 Statement of theorem for positive integral power 4.2 Expansion 4.3 Simple Examples on expansion	**04**	**06**
	Total	**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.

2.In each topic, corresponding applications will be explained

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome CCF105-5 : *To memorize and solve problems using trigonometric formulae.*			
5	**Trigonometric Ratios and Identities** 5.1 Fundamental Identities(Simple examples) 5.2 Definition of radian measure 5.3 Conversion of degree into radian and vice versa of standard angles	**02**	**04**
6	**Trigonometric ratios of Compound and Allied Angles** 6.1 Proofs of sine ,cosine and tan of (A+B) and (A-B) 6.2 Examples	**06**	**08**
7	**Trigonometric ratios of Multiple Angles** 7.1 Proofs of sine, cosine and tangent of 2θ, 3θ 7.2 Examples	**05**	**10**
8	**Factorization and Defactorization Formulae** 8.1 Proofs of above formulae 8.2 Examples	**04**	**08**
9	**Inverse Trigonometric Ratios** 9.1 Definition 9.2 Principle value 9.3 Proof of standard formulae 9.4 Examples	**07**	**10**
	Total	**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. **2**.In each topic corresponding applications will be explained			

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	Application	
1	Determinants	-	2	4	06
2	Partial Fractions	2	2	8	12
3	Matrices	2	2	12	16
4	Binomial Theorem	2	-	4	06
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
TOTAL		16	10	54	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.

B) TUTORIALS

Sr.No	Topics	Tutorial Content (10 problems in each tutorial)
1	Determinants	Examples on expansion of determinants , Cramer's rule, consistency of equations.
2	Partial Fractions	To resolve given function into partial fractions-Different cases
3	Matrices	Examples on addition ,Subtraction and Multiplication of Matrix
4	Matrices	To find adjoint ,Inverse of a given matrix, To solve simultaneous equation by Matrix method
5	Binomial Theorem	To expand $(x+y)^n$ by Binomial theorem,
6	Trigonometric Ratios and Identities	Examples on conversion of degree to radian and vice versa, simple examples on trigonometry.
7	Allied Angles	Examples on Allied angles
8	Compound Angles	Examples on Compound angles
9	Factorization & De-factorization angles	Examples on Examples on Allied angles
10	Inverse Trigonometric Ratios	Examples on principle value and trigonometric functions

INSTRUCTIONA STRATEGIES :

Instructional Methods:

1. Lectures cum Demonstrations
2. Tutorials

Teaching and Learning resources:

1. Chalk board
2. Item Bank

REFERENCE MATERIAL :
a) Books:

Sr. No.	Author	Title	Publisher
1.	G.V. Kumbhojkar	A Text Book on Engineering Mathematics (First Year Diploma	Phadake Prakashan, Kolhapur
2.	Patel,Rawal and others	Basic Mathematics	Nirali Prakashan,Pune
3.	P.M.Patil and Others	Basic Mathematics	Vision Prakashan, Pune
4.	Engineering Mathematics	S. S. Sastry	Prentice Hall of India
5.	S.P.Deshpande	Mathematics for polytechnic	Pune Vidyarthi Griha,Pune

b) Website

i) www.khanacademy.org
ii) www.easycalculation.com
iii) www.math-magic.com

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COURSE ID :

Course Name : ENGINEERING MATHEMATICS
Course Code : CCF106
Course Abbreviation : FEMT

TEACHING AND EVALUATION SCHEME:

Pre-requisite Course(s) : CCF105 Basic Mathematics

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	03	04
Practical	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) :

CCF106-1 : To solve problems on two dimensional co-ordinate geometry for straight line and circles.

CCF106-2 : To find approximate solution of algebraic equations and simultaneous equations by various methods.

CCF106-3 : To find limits of different types of functions using various methods.

CCF106-4 : 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	Programme Outcomes POs and PSOs											
	PO 1 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long leaning	PSO1 Plan & Organize	PSO2 Production & Management
Competency: Apply principles of Engineering Mathematics to solve Engineering problems	3	2	3	2	-	-	1	2	1	3	1	1
CCF106-1 : To solve problems on two dimensional co-ordinate geometry for straight line and circles.	3	2	2	-	-	-	1	1	1	3	1	1
CCF106-2 : To find approximate solution of algebraic equations and simultaneous equations by various methods.	3	2	3	-	-	-	1	1	1	3	1	1
CCF106-3 : To find limits of different types of functions using various methods.	3	2	3	1	2	-	1	2	3	3	1	1
CCF106-4 : To solve the problems of maxima, minima and geometrical applications.	3	2	3	1	2	-	1	2	3	3	1	1

CONTENT:

C. THEORY :

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course outcome CCF106-1 : *To solve problems on two dimensional co-ordinate geometry for straight line and circles.*			
1	**Point and Distances** 1.1 Distance formula (Only mention, No examples) 1.2 Section formula & midpoint formula (No Examples & without proof) 1.3 Centroid of a triangle & Area of Triangle 1.4 Co-linearity	**02**	**04**
2	**The Straight line** 2.1 Slope, intercepts & various methods of finding slope 2.2 Conditions for two straight lines to be parallel and Perpendicular to each others 2.3 Various forms of equations of straight line 2.4 Perpendicular distance of a point from a line 2.5 Distance between two parallel lines 2.6 Angle between two straight lines 2.7 Intersection of two straight lines & the equation of line passing through this point of intersection	**06**	**08**
3	**Circle** 3.2 Equations of Circle (various forms) 3.3 Examples to find equation of circles	**04**	**08**
Course outcome CCF106-2 : *To find approximate solution of algebraic equations and simultaneous equations by various methods.*			
4	**Numerical solution of Algebraic Equations** 4.1 Bisection Method 4.2 Regula- Falsi Method	**06**	**10**
5	**Numerical solution to simultaneous equations** 5.1 Jacobi's Method 5.2 Gauss-Seidel method	**06**	**10**
	Total	**24**	**40**

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course outcome CCF106-3 : *To find limits of different types of functions using various methods.*			
6	**Functions** 6.3 Definition and Concept of function 6.4 Definition of Odd & Even functions, Explicit & implicit functions, Composite functions, Parametric functions 6.5 Value of a function 6.6 Examples on value of functions, Odd & Even functions , Composite functions	**03**	**06**
7	**Limits** 7.1 Definition 7.2 Limits of algebraic functions by factorization, simplification, rationalization , Limit as $x\rightarrow\infty$ 7.3 Limits of trigonometric functions by factorization, formula $\frac{\sin x}{x}$ as $x\rightarrow 0$, substitution .	**06**	**08**
Course outcome CCF106-4 : *To solve the problems of maxima, minima and geometrical applications.*			
8	**Differentiation** 8.1 Definition, Derivative of standard functions (without poof), 8.2 Derivative of sum, difference, product and quotient of two or more functions 8.3 Derivative of composite functions 8.4 Derivative of Inverse functions 8.5 Derivative of Implicit functions 8.6 Derivative of Parametric functions 8.7 Derivative of exponential and logarithmic functions 8.8 Logarithmic differentiation 8.9 Differentiation of second order	**12**	**20**
9	**Applications Of Derivatives** 9.1 Geometrical meaning of derivative (To find equation of Tangent and normal) 9.2 Maxima and minima of functions	**03**	**06**
	Total	**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. **2**. In each topic corresponding applications will be explained			

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	Application	
1	Point and Distances	2	--	2	4
2	Straight line	2	2	4	8
3	Circle	2	2	4	8
4	Numerical solution of Algebraic Equations and simultaneous Equations	2	2	16	20
5					
6	Functions	2	-	4	6
7	Limits	2	2	4	8
8	Differentiation	4	4	12	20
9					
10	Applications Of Derivatives	--	--	6	6
Total		16	12	52	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.

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

Sr No.	Topic	Tutorial Content (10 problems in each tutorial)
1	Point and Distances	Examples on Centriod of triangle,area of triangle,colliarity
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	Circle	To find equation of Circle- Different forms
4	Num.solution of Algebraic & simultaneous Eq	Numerical solution of algebraic equations.
5		Numerical solution of simultaneous equations
6	Functions	Examples on functions
7	Limits	Evaluation of limits by Factorisation,Rationalization,Simplification,Infinity method Evaluation of limits of Trigonometric functions
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.

INSTRUCTIONAL STRATEGIES:

Instructional Methods:

1. Lectures cum Demonstrations
2. Tutorials

Teaching and Learning resources:

1. Chalk board
2. Item Bank

REFERENCE MATERIAL:

a) Books:

Sr. No.	Author	Title	Publisher
1.	G.V. Kumbhojkar	Engineering Mathematics III	Phadake Prakashan, Kolhapur
2.	Patel,Rawal,	Engineering Mathematics	Nirali Prakashan,Pune
3.	Mathematics for Polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan
4.	Sameer Shah	Engineering Mathematics	Tech-Max Publication, Pune
5.	A.M. Vaidya	Applied Mathematics	Central Techno

b) Websites i) www.khanacademy.org ii) www.easycalculation.com iii) www.math-magic.com

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COURSE ID :

Course Name : ENGINEERING DRAWING - II (CE/ME/SM/MT)
Course Code : CCF108
Course Abbreviation : FEDB

TEACHING AND EVALUATION SCHEME:

Pre-requisite Course(s) : CCF107 Engineering Drawing - I

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 Examination	Term Work	Oral Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i. 25 marks for each practical ii. One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma-III	-	
Marks	**20**	**--**	**80**	**25**	**-**	**125**

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

COMPETENCY:

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

Cognitive Understand &visualize the given component drawing.

Psychomotor Produce engineering drawing from the given problem

Affective Attitude of using i) Procedures ii) Practices iii) Drawing instruments iv) Techniques v) Drafting skill

COURSE OUTCOMES:

CCF108-1 Produce orthographic drawing from given pictorial view.

CCF108-2 Produce sectional orthographic drawing from given pictorial view.

CCF108-3 Draw proportionate free hand sketches.

CCF108-4 Interpret the views & complete the missing view.

CCF108-5 Visualize & draw accordingly the pictorial view by correlating the given views.

CCF108-6 Construct development of lateral surfaces.

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan & Organize	PSO2 Production & Management
Competency:	3	3	3	3	2	-	-	2	2	3	2	1
CCF108-1	1	2	3	3	-	-	-	1	1	3	2	1
CCF108-2	1	2	3	3	-	-	-	1	1	3	2	1
CCF108-3	1	2	3	3	-	-	-	1	1	3	2	1
CCF108-4	1	2	3	1	-	-	1	1	-	3	2	1
CCF108-5	2	2	3	2	-	-	-	-	-	3	2	1
CCF108-6	2	2	3	3	-	-	-	1	1	3	2	2

CONTENT:
A. THEORY:

SECTION - I

Sr. No.	Topics	Teaching (Hours)	Theory Evaluation Marks
Course Outcome **CCF108**-1 *Produce orthographic drawing from given pictorial view.*			
1.	**Orthographic Projection** 1.1 Introduction of Orthographic Projection-First and Third angle Projection Method 1.2 Conversion of Pictorial view into Orthographic Views. (First angle Projection Method Only) 1.3 Dimensioning Technique as per SP-46	**06**	**16**
Course Outcome **CCF108-*2*** *Produce sectional orthographic drawing from given pictorial view.*			
2.	**Sectional Views.** 2.1 Types of sections 2.2 Conversion of pictorial view into sectional Orthographic views. (First Angle Projection Method only)	**06**	**16**
Course Outcome **CCF108-3** *Draw proportionate free hand sketches.*			
3.	**Free Hand Sketches** 3.1Profiles of Screw Threads(V and Square Thread) Conventional representation of threads. 3.2 Free hand sketches of nuts and bolts, Washer, Locking arrangement of nuts, Foundation bolts 3.3Riveted and Welded Joints.	**04**	**08**

SECTION – II

Sr. No.	Topics	Teaching (Hours)	Theory evaluation Marks
Course Outcome **CCF108-4** *Interpret the views & complete the missing view*.			
4.	**Missing Views.** 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 view into sectional Orthographic views (First Angle Projection Method only)	**04**	**08**
Course Outcome **CCF108-5** *Visualize & draw accordingly the pictorial view by correlating the given views.*			
5.	**Isometric Projection** 5.1 Introduction 5.2 Isometric Axis 5.3 Isometric scale 5.4 Isometric view and Isometric Projection 5.5 Conversion of Orthographic Views into Isometric View/Projection(Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces)	**06**	**16**
Course Outcome **CCF108-6** *Construct development of lateral surfaces.*			
6.	**Developments of Surfaces** 6.1 Methods of Development 6.2 Developments of Lateral surfaces of right solids Cube, Prism, Cylinders,Pyramid and Cone 6.3 Applications of Development such as Tray, Funnel, Chimney, Pipe ends etc.	**06**	**16**
	Total	**32**	**80**

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.

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	Orthographic projection	04	02	02	CCF108-1	08
2	Sectional Views.	04	04	12	CCF108-2	20
3	Free Hand Sketches	02	04	04	CCF108-3	12
4	Missing Views	02	04	02	CCF108-4	08
5	Isometric Projection	04	04	08	CCF108-5	16
6	Developments of Surfaces	04	12	02	CCF108-6	16
	Total	20	30	30		80

B. TERM 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	Orthographic projection (1 Sheet)	To develop drawing ability to draw Orthographic projection	CCF108-1
2	Orthographic projection Using CAD (1 Sheet)	To develop CAD software skill in drawing and design.	CCF108-1
3	Sectional Views. (1 Sheet)	To develop drawing ability in sectional views	CCF108-2
4	Free Hand Sketches (1 Sheet)	To develop ability to draw free hand sketches of machine components, screw thread profile, riveted and welded joints	CCF108-3
5	Missing Views (1 Sheet)	To develop ability to draw Missing views and convert given view into sectional view.	CCF108-4
6	Isometric Projection (1 Sheet)	To develop ability to draw Isometric projection	CCF108-5
7	Development of Surfaces (1 Sheet)	To develop drawing ability in Development of surfaces of cone, prism, pyramid and cylinder	CCF108-6

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

a) 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

b) Progressive Skill Test :

One mid-term ***Progressive Skill*** *Test* of **25**marks 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

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

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:

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
4) http://www.engineeringdrawing.org/
5) http://www.teachengineering.org/view_activity
6) www.howtoread.co.in/2013/06/how-to-read-ed.html
7) http://www.slideshare.net/akhilrocker143/edp
8) http://www.24framesdigital.com/pstulpule

COURSE ID :

Course Name : APPLIED MECHANICS
Course Code : CCF110
Course Abbreviation : FAPM

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	Practical	Theory Examination	Term Work	
Details of Evaluation	Average of two tests of 20 marks each	i. 25 marks for each practical ii. One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma-III	
Marks	**20**	**--**	**80**	**25**	**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 :

CCF110-1 Determine resultant of coplanar force systems
CCF110-2 Solve problems on bodies in equilibrium with and without friction
CCF110-3 Solve problems on statics graphically
CCF110-4 Solve problems on centre of gravity of laminas and solids
CCF110-5 Solve problems on motion using kinematic and kinetic equations
CCF110-6 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 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan & Organize**	**PSO2 Production & Management**
Competency: Apply principles of applied mechanics to solve engineering problems.	3	3	3	2	2	-	-	1	1	1	2	2
CCF110-1 Determine resultant of coplanar force systems	3	3	-	-	2	-	-	1	1	2	2	2
CCF110-2 Solve problems on bodies in equilibrium with and without friction	3	3	3	3	2	-	-	1	1	2	2	2
CCF110-3 Solve problems on statics graphically	2	3	3	1	1	-	-	1	1	1	2	2
CCF110-4 Solve problems on centre of gravity of laminas and solids	3	3	2	2	3	-	-	1	1	2	2	2
CCF110-5 Solve problems on motion using kinematic and kinetic equations	3	3	2	1	3	-	-	1	1	2	2	2
CCF110-6 Solve problems on simple lifting machines	2	2	1	1	2	-	-	1	1	1	2	2

CONTENT :

A) THEORY :

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course Outcome CCF110-1 *Determine resultant of coplanar force systems*		
1	**Resolution and Composition of Forces** 1.1 Definition and meaning of the terms mechanics, applied mechanics, particle, rigid body, mass, force, weight 1.2 Attributes of a force : Magnitude, direction, sense and position. Principle of transmissibility. Graphical representation of force 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 1.4 Moment of a force about a point 1.5 Couple : properties of couple. Field examples of moments and couples 1.6 Resolution of a force into two orthogonal and oblique components 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 1.8	**10**	**12**
	Course Outcome CCF110-2 *Solve problems on bodies in equilibrium with and without friction*		
2.	**Equilibrium of Bodies** 2.1 Definition of equilibrium of a body and equilibrant. Conditions of equilibrium. Law of moments. 2.2 Supports : Definition, types and reactions. Free-body diagrams of bodies. Field examples. 2.3 Lami's theorem. Field examples. 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) 2.5 Statically determinate problems on bodies in equilibrium (analytical method)	**10**	**10**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course Outcome CCF110-1 *Determine resultant of coplanar force systems*		
	Course Outcome **CCF110-3** Solve problems on statics graphically		
3	**Graphic Statics** 3.1 Advantages and limitations of graphical methods. Bow's notation. Space diagram, vector diagram 3.2 Parallelogram, triangle and polygon laws of forces 3.3 Problems on resultant of concurrent force systems 3.4 Funicular polygon. Problems on resultant of non-current force systems 3.5 Problems on reactions of statically determinate beams with simple and hinged supports carrying concentrated loads	**06**	**08**
4	**Friction** 4.1 Definition of friction. Static and dynamic friction. Laws of friction. Coefficient of friction. Angle of repose, Angle of friction. Field examples. 4.2 Problems involving bodies on horizontal and inclined rough surfaces and ladders.	**06**	**10**
	Total	**32**	**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.			

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course Outcome CCF110-4 *Solve problems on centre of gravity of laminas and solids*		
5	**Centroid and Centre of Gravity** 5.1 Definition and field applications of centroid and centre of gravity 5.2 Centroid of standard line figures. Problems involving composite figures made up of standard line figures 5.3 Centroid of standard laminas. Problems involving composite laminas made up of standard laminas 5.4 Centre of gravity of standard solids. Problems involving simple composite solids made up of standard solids	**08**	**08**
	Course Outcome CCF110-5 *Solve problems on motion using kinematic and kinetic equations*		
6	**Rectilinear Motion** 6.1 Definition of motion, dynamics, kinematics, kinetics, displacement, speed, velocity, acceleration, motion under gravity. Simple problems with uniform acceleration. Field examples 6.2 Newton's laws of motion. Simple problems	**08**	**08**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	6.3 Definition of momentum. Law of conservation of momentum. Simple problems		
7	**Angular Motion** 7.1 Definition of angular motion, angular displacement, angular velocity, angular acceleration, torque, moment of inertia. Field examples 7.2 Kinematic and kinetic equations of angular motion. Simple problems with uniform angular acceleration	**04**	**06**
8	**Work, Power, Energy** 8.1 Definition of work done by a force. Work done by torque 8.2 Definition of energy. Forms of energy. Law of conservation of energy. Field examples 8.3 Definition of power 8.4 Simple problems on work, power and energy	**04**	**08**
	Course Outcome CCF110-6 *Solve problems on simple lifting machines*		
9	**Simple Lifting Machines** 5.1 Definition of simple lifting machine, load, effort, mechanical advantage, velocity ratio, efficiency at a load. Field examples 5.2 Law of machine, maximum mechanical advantage, maximum efficiency, reversibility or non-reversibility of a machine at a load 5.3 Friction in machine, ideal machine, effort lost in friction, ideal effort, ideal load 5.4 Problems on simple lifting machines.(Problems or questions on any particular machines are not expected; they shall be covered in practicals)	**08**	**10**
	Total	**32**	**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.			

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	04	06	CCF110-1	12
2	Equilibrium of bodies	02	04	04	CCF110-2	10
3	Graphics Statics	02	02	04	CCF110-3	08
4	Friction	02	04	04	CCF110-2	10
5	Centroid and Centre of Gravity	02	02	04	CCF110-4	08
6	Rectilinear Motion	02	02	04	CCF110-5	08
7	Angular Motion	02	02	02	CCF110-5	06
8	Work, Power, Energy	02	02	04	CCF110-5	08
9	Simple Lifting Machines	02	04	04	CCF110-6	10
TOTAL		18	26	36		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.

B) TERM WORK

Practical Exercises and related skills to be developed :

The following practical exercises shall be conducted as Term Work as detailed in the *Laboratoty 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 graphics/ videos on field applications of mechanics	1. Information collection and presentation 2. Motivation through field exposure	CCF110-1 to CCF110-6
2-7	**Experiments on equilibrium of bodies :** (*any six*) 1. Verification of law of polygon of forces 2. Verification of law of parallelogram of forces 3. Verification of Varignon's theorem of moments for non-concurrent force system 4. Verification of Lami's theorem 5. Determination of reactions of beam 6. Determination of coefficient of friction and verification of laws of friction 7. Determination of centroid and centre of gravity	1. Self learning ability using laboratory manual 2. Measuring dimensions and angles 3. Applying concepts studied 4. Plotting and interpreting graphs 5. Drawing real view diagrams of machine 6. Time management and team working skills 7. Presentation skills	CCF110-2 CCF110-4

8-11	**Experiments on simple lifting machines:** (*any four*) 1. Study of differential axle and wheel 2. Study of simple screw jack 3. Study of worm and worm wheel 4. Study of single gear crab 5. Study of double gear crab 6. Study of Weston's differential pulley block 7. Study of two sheaves and three sheaves pulley block 8. Study of worm geared pulley block	1. Studying mechanism of machine 2. Deriving expression for velocity ratio of machine 3. Measuring dimensions of machine parts using thread, etc. 4. Taking readings of loads and efforts 5. Plotting and interpreting graphs 6. Drawing real view diagrams of machine 7. Time management, team working and presentation skills	CCF110-6
12	**Graphic Statics :** One problem each on concurrent force system, parallel force system, non-current non-parallel force system and reactions of beam on graph papers	1. Planning paper space 2. Choice of proper scale 3. Drawing and presentation skills 4. Applying concepts studied	CCF110-3

C) 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	Term-work assignment

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

c) Assessment Criteria for Term 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
TOTAL		**50**

ii) Progressive Skill Test :

One mid-term *Progressive Skill Test* of 50 marks shall be conducted as per criteria given in *Laboratory Manual for Applied Mechanics*
Final marks of term work shall be awarded as per *Assessment Pro-forma II.*

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. Item Bank

REFERENCE MATERIAL :

a) Books / Journals / IS Codes

Sr. No.	Author	Title	Publisher
1.	Dixit,Nehate,Shaikh	Text Book on Applied Mechanics	Vision
2.	Sunil Deo	Text book on Engineering Mechanics	Nirali
3.	Bhavikatti and Rajashekharappa	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*

*** * ***

COURSE ID :

Course Name : WORKSHOP PRACTICES – 1 (ME/SM/MT)
Course Code : CCF112
Course Abbreviation : FWSB

TEACHING AND EVALUATION 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 Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral Examination	
Details of Evaluation	Average of two tests of 20 marks each	i) 25 marks for each practical ii) One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma III	As per Proforma	
Marks	**Nil**	--	**-**	**50**	--	**50**

RATIONALE:

Workshop practice I mainly deals with Fitting, Plumbing and Wood working. 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 wood working, plumbing and welding technique.

Cognitive: Understand various trade practices in engineering
Psychomotor: Use of various tools in Fitting, Wood working, Plumbing shop.
Affective: Develop **a**ttitude of i) Interpret drawing ii) Safety

COURSE OUTCOMES:
CCF 112-1 Select different types of wood material.
CCF 112-2 Select different types of tools used in workshop.
CCE 112-3 Preparing simple component in workshop.
CCF 112-4 Interpret drawing.
CCF 112-5 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 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan & Organize**	**PSO2 Production & Management**
Competency:	1	-	3	-	-	-	-	3	-	-	2	2
CCF112-1	1	-	3	-	-	-	-	3	-	-	1	1
CCF112-2	1	-	3	-	-	-	-	3	-	-	2	2
CCF112-3	1	-	3	-	-	-	-	3	-	-	2	2
CCF112-4	1	-	3	-	-	-	-	3	-	-	2	2
CCF112-5	1	-	3	-	-	-	-	3	-	-	2	2

Course Content:- TERM WORK

Sr. No.	Topic/ Sub-Topic	Practical (Hours)/ Evaluation (Marks)	Skills/ Competencies to be developed	Course outcome
1.	**Fitting Shop** : a) Demonstration of different Fitting tools, drilling and power tools. b) Demonstration of different operations like marking, filing, cutting, drilling, tapping etc. One simple fitting job (Male Female assembly type involving practice of Filing, Drilling, Cutting, Tapping etc.	10/16	a. Study of fitting tools, identifying materials b. Measuring dimensions c. Interpretation of drawing. d. Selection of tolls e. Time management and observing safety habits. f. Operate on drilling machine, saw m/c.	CCF112-2 to CCF112-5
2.	**Plumbing Shop:-** a. Demonstration of tools. b. One job on simple pipe joint with nipple coupling for standard pipe. Pipe threading using standard die set (One job per one group of 04 students) c. Demonstration of PVC pipe joint with various PVC fitting & accessories.	10/16	a. Study of plumbing tools, identifying materials. b. Interpretation of drawing c. Treading with dies on pipe d. Time management and observing safety habits. e. Selection of pipe joint & fitting.	CCF112-2 to CCF112-5
3.	**Wood Working Shop:-** a. Demonstration of different wood working tools. b. Indentify, select & use of various Marking, Measuring, cutting, holding & Striking tools & equipments c. Operate control different machines & equipments in respective shop. d. Know basic workshop processes. e. Demonstration of different wood working processes like Planning, Marking, Chiseling, Grooving, Turning of wood etc. (One simple job based on the above processes for 04 to 06 students group).	12/16	a. Study of wood working tools, Identifying materials. b. Measuring dimensions. c. Interpretation of drawing d. Operating on planning, Cutting, Drilling machines. e. Time management and observing safety habits.	CCF112-1 to CCF112-5

The students will submit the following.

Workshop record book showing the details of the job viz. Drawing, Raw material size, time required completing the job.

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 TERM WORK AND PRACTICAL EXAMINATION

a) Assessment Criteria for Term 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
TOTAL		**50**

ii) Progressive Skill Test :

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

Instructional Strategies :-

Demonstration during Practicals.
Workshop Record Book.

Teaching and learning resources:-

Shop Demonstration
Hands on training on machine

Reference books

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

Websites:

1) http://nptel.ac.in
2) www.egr.msu.edu/~pkwon/me478

COURSE ID :

Course Name : WORKSHOP PRACTICES – 2 (ME/SM/MT)
Course Code : CCF116
Course Abbreviation : FWSF

TEACHING AND EVALUATION SCHEME :

Pre-requisite Course(s) : CCE112 Workshop Practices – 1
Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	Nil	02
Practical	02	

Evaluation Scheme :

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral Examination	
Details of Evaluation	Average of two tests of 20 marks each	i) 25 marks for each practical ii) One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma III	-	
Marks	**Nil**	--	**-**	**50**	--	**50**

RATIONALE:

The workshop practices II mainly deals with Wood working, Sheet metal, Welding and Smithy work 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, soldering, plumbing, drilling, taping, etc.

COMPETENCY:

Prepare a simple job using wood working, sheet metal, Welding and Smithy technique

Cognitive : Understand various trade practices in engineering
Psychomotor : Use of various tools in wood working, sheet metal, Welding and smithy shop
Affective : Develop **a**ttitude of i) Interpret drawing ii) Safety practice

COURSE OUTCOMES:

CCF 116-1 Select different types of sheet metal and Welding tools.

CCF 116-2 Prepare the wood working, sheet metal, Welding and smithy components.

CCF 116-3 Interpret drawing.

CCF 116-4 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 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Organize	PSO 2 Production & Management
Competency:	1	-	3	-	-	-	-	3	-	-	2	2
CCF116-1	1	-	3	-	-	-	-	3	-	-	2	2
CCF116-2	1	-	3	-	-	-	-	3	-	-	1	1
CCF116-3	1	-	3	-	-	-	-	3	-	-	2	2
CCF116-4	1	-	3	-	-	-	-	3	-	-	2	2

Course Contents :- TERM WORK

Sr. No.	Topics/ Sub-Topics	Practical (Hours)/ Evaluation (Marks)	Skills/ Competencies to be developed	Course outcome
1	**Wood Working shop** :- a) Demonstration on Wood turning lathe involving different operations. b) One job on Tenon and Mortise joint.	09/15	a) Measuring dimensions b)Interpretation of drawing c) Operations on Wood turning lathe, drilling machines d) Time management and observing safety habits	CCF 1 to CCF 4
2	**Sheet Metal Shop** :- a) Demonstration of different sheet metal tools and machines. b) Demonstration of sheet metal operations like Sheet cutting, Bending, Edging, End curling, Lancing, Riveting etc. c) One Job involving sheet metal operations from Dustbin, Letter Box, Tray, Bucket etc.	09/15	a)Study of sheet metal tools, identifying materials b)Measuring dimensions c)Interpretation of drawing d) Operating sheet cutting bending machines e) Time management and observing safety habits f) Prepare utility article	CCF 1 to CCF 4
3	**Welding shop** :- a) Demonstration of various welding tools, joints of metals, type of welding machines. b) Demonstration of arc welding techniques. 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 - 1) Window frame. 2) Grill. 3) Sanitary window frame. 4) Supporting frame. 5) Stool frame. 6) Bench frame etc.	07/10	a) Study of welding tools, Identifying materials b)Measuring dimensions c) Interpretation of drawing d) Operating welding machines. e) Time management and observing safety habits	CCF 1 to CCF 4

4	**Smithy shop** :- a) Demonstration of different forging tools. b) Demonstration of different forging processes like shaping cau liking fullering setting down operations etc. c) One job like hook page flat chisel or any hardware item Note - One job of standard size (salable/marketable article of per student)	07/10	a)Studying forging tools, Identifying materials b)Measuring dimensions c)Interpretation of drawing d) Selection of tools e) Time management and observing safety habits	CCF 1 to CCF 4

The students will submit the following.

Workshop record book showing the details of the job viz. Drawing, Raw material size, time required completing the job.

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 TERM WORK AND PRACTICAL EXAMINATION

a) Assessment Criteria for Term 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
TOTAL		**50**

ii) Progressive Skill Test :

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

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

Instructional Strategies :-

Demonstration during Practical's.

Workshop Record Books.

Teaching and learning resources:-

Shop Demonstration

Hands on training on machine

Reference Books :-

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

Websites:

1) http://nptel.ac.in
2) www.egr.msu.edu/~pkwon/me478

COURSE ID :

Course Name : ENGINEERING DRAWING -1 (CE/ME/MT)
Course Code : CCF117
Course Abbreviation : FEDA

TEACHING AND EVALUATION SCHEME:

Pre-requisite Course(s) : Nil

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 Examination	Term Work	Oral Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i. 25 marks for each practical ii. One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma-III	-	
Marks	--	**50**	--	**25**	-	**75**

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.

COMPETENCY:

Use various drawing Instruments for drafting and sketching solid geometry

Cognitive: Understand various drawing procedures..

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

Affective: Attitude of using i) Procedures ii) Practices iii) Drawing Instruments iv) Accuracy v) Drafting Skill

COURSE OUTCOMES:

CCF117-1 Understand various fundamentals in engineering drawing.
CCF117-2 Produce different types of engineering curves.
CCF117-3 Produce the projection of point & lines inclined to one reference plane..
CCF117-4 Produce the projection of different planes &solids**.**
CCF117-5 Produce sectional views of different types of solids.

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Organize	PSO2 Production & Management
Competency:	3	3	3	3	2	-	-	2	2	3	2	2
CCF117-1	3	3	2	3	-	-	-	1	1	3	2	2
CCF117-2	2	2	3	3	1	-	-	1	1	2	2	2
CCF117-3	2	2	3	3	1	-	-	1	1	3	1	2
CCF117-4	2	3	3	3	1	-	-	2	2	3	2	2
CCF117-5	3	3	3	3	1	-	-	2	2	2	2	1

CONTENT:
A. THEORY:

SECTION - I

Sr. No.	Topics	Teaching (Hours)	Theory Evaluation Marks
Course Outcome **CCF117-1** *Understand various fundamentals in engineering drawing*			
1.	**Introduction To Engineering Drawing** 1.1 Drawing Instruments and their uses 1.2 Standard sizes of drawing sheets (ISO-A series) 1.3 Letters and numbers (single stroke vertical) Convention of lines and their applications. 1.4 Scale (reduced, enlarged & full size) Plain scale and Diagonal scale. 1.5 Dimensioning technique as per SP-46 (Latest Edition) Types and applications of chain, parallel and Co-ordinate dimensioning	**04**	**08**
Course Outcome **CCF117-2** *Produce different types of engineering curves*			
2.	**Engineering Curves** 2.1 Conic curves and their applications 2.2 Ellipse by Arc's of circle method & Concentric circles method. 2.3 Parabola by Directrix and focus method & Rectangle method 2.4 Hyperbola by Transverse Axis focus Method & Rectangular hyperbola (Inclined axes). 2.5 Involutes of circle,triangle,square & pentagon, 2.6 cycloid, epicycloids, hypocycloid 2.7 Helix & Archimedean spiral.	**07**	**20**
Course Outcome **CCF117-3** *Produce the projection of point & lines inclined to one reference plane*			
3.	**Projection Of Point And Lines** 3.1 Projection of points when point is in first quadrant Only 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)	**03**	**12**

SECTION – II

Sr. No.	Topics	Teaching (Hours)	Theory evaluation Marks
Course Outcome* CCF117-*4 *Produce the projection of different planes &solids.*			
4.	**Projection Of Planes** 4.1 Projection of Planes - Circular, Square, Triangular, Rectangular, Pentagonal, Hexagonal Shapes Inclined To One Reference Plane And perpendicular to other Reference Plane. (Planes in First Quadrant Only)	**05**	**08**
Course Outcome* CCF117-*4 *Produce the projection of different planes &solids.*			
5.	**Projection Of Solids** 5.1 Projection of Solids Like Cube, Prisms, Pyramids, Cone, Cylinders and Tetrahedron. (Axis of Solids inclined to one reference plane and Parallel to other Reference Plane)	**05**	**16**
***Course Outcome* CCF117-5** *Produce sectional views of different types of solids.*			
6.	**Sections of Solids** 6.1 SectionsOf 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)	**06**	**16**
***Course Outcome* CCF117-1** *Understand various fundamentals in engineering drawing*			
7.	**AUTOCAD** 7.1 Introduction to CAD software (Basic commands like Draw, modify). Advantages of CAD, 7.2 Geometrical Constructions 7.3 Draw a basic 2-D geometrical entities using CAD	**02**	**NIL**
	Total	**32**	**80**
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			

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 To Engineering Drawing	04	02	02	CCF117-1	08
2	Engineering curves	04	04	12	CCF117-2	20
3	Projection of Point And Lines	04	04	04	CCF117-3	12
4	Projection of Planes	02	04	02	CCF117-4	08
5	Projection of Solids	04	04	08	CCF117-4	16
6	Sections of Solids	02	12	02	CCF117-5	16
	Total	20	30	30		80

B. TERM 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	Geometrical Constructions Using CAD (1 Sheet)	To develop drawing skill	CCF117-1
2	Engineering curves (1 Sheet)	To develop drawing ability in conics	CCF117-2
3	Projections of line (1 Sheet)	To develop drawing ability in Projections of line	CCF117-3
4	Projections of Planes (1 Sheet)	To develop drawing ability in Projections of Planes	CCF117-4
5	Projections of Solids (1 Sheet)	To develop drawing ability in Projections of Solids	CCF117-4
6	Sections of Solids (1 Sheet)	To develop drawing ability in Sections of Solids	CCF117-5

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

a) 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

b)Progressive Skill Test :

One mid-term ***Progressive Skill*** *Test* of **25**marks 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

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

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:

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

4)http://www.engineeringdrawing.org/

5)http://www.teachengineering.org/view_activity

6)www.howtoread.co.in/2013/06/how-to-read-ed.html

7) http://www.slideshare.net/akhilrocker143/edp

8) http://www.24framesdigital.com/pstulpule

LEVEL – II

COURSE ID :

Course Name : GENERIC SKILLS
Course Code : CCF201
Course Abbreviation :FGNS

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	Practical **	TW	
Detailsof Evaluation	- *Nil* -	One mid-semester Skill Test(2 hrs) * of 25 marks	- *Nil* -	Term End Practical Exam (2 hrs)	Pro-forma VI	
Marks	- *Nil* -	--	- *Nil* -	50	25	75

*** 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 Performa V.*

RATIONALE:

Acquisition of technical and entrepreneurial competencies is founded on certain generic skills that are fundamentally essential for all disciplines of technology. Considering the age group and socio-economical background of the students of the Institute, a set of minimum essential generic skills has been identified and categorized as i) Concentration skills, ii) Language skills, iii) Learning Skills, iv) Aesthetic Skills, v) Behavioral Skills and vi) Creativity Skills. These generic skills will be studied and practiced in this course. Communication Skills form another major category of generic skills which shall be studied in separate course named *Communication Skills.* For mastery and perfection in these skills, consistent practice and an integrated application is necessary in all subjects of the Programme. Generic skills are essential to improve the overall quality of learning of the student for all the subjects.

COMPETENCY :
Apply generic skills to achieve refinement in overall development of personality as follows:

Cognitive : Understanding and applying generic skills in various situations

Psychomotor : i) Use of proper concentration ii)analyzing routine activity for formal and informal learning iii)Use of correct vocabulary .iv) use of aesthetic skills in all dimensions of life.

Affective : Attitude of i) concentration ii)confidence iii) manners iv) neatness v) aesthetic presentation

COURSE OUTCOMES:

CCF201-1 Apply concentration skills in various tasks.
CCF201-2 Apply learning skills to gain new knowledge, skills and techniques.
CCF201-3 Make use of language skills for effective interaction.
CCF201-4 Organize studying skills, self motivation for best performance.
CCF201-5 Adapt behavioral and aesthetical skills.
CCF201-6 Adapt creativity skills for doing work creativity.

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan & Organize	PSO2 Production & Management
Competency:	3	3	3	2	2	-	3	1	1	1	2	2
CCF201-1	3	3	-	-	2	-	2	1	1	2	2	2
CCF201-2	3	3	3	3	2	-	2	1	1	2	2	2
CCF201-3	2	3	3	1	1	-	2	1	1	1	2	2
CCF201-4	3	3	2	2	3	-	2	1	1	2	2	2
CCF201-5	3	3	2	1	3	-	2	1	1	2	2	2
CCF201-6	2	2	1	1	2	-	3	1	1	1	2	2

CONTENT:

E. THEORY :

Sr. No.	Topics / Sub-topics	Lectures (Hours)
	Course Outcomes CCF201-1 Apply concentration skills in various tasks.	
1	**Overview of generic skills** 1.1 Definition of generic skills, life skills, soft skills. Difference between generic skills and specialized skills 1.2 Important generic skills for technicians: Concentration skills, learning skills, language skills, communication skills, aesthetic skills, behavioral skills, creativity skills 1.3 Importance of generic skills 1.4	**02**
	Course Outcomes CCF201-2 Apply learning skills to gain new knowledge, skills and techniques.	
2	**Concentration Skills** 2.1 Concentration of mind: Meaning and importance. Hurdles and Common remedies. 2.2 Thoughts: Intensity, speed and duration of thoughts. Positive, negative and neutral thoughts. Emotions. Management of thoughts. 2.3 Concentration skills : Breathing exercises and *pranayam* 2.4 Concentration skills : Chanting *omkar* 2.5 Concentration skills : Prayer - Daily input of positive Thoughts 2.6 Concentration skills : Meditation	**06**
	Course Outcomes CCF201-3 Make use of language skills for effective interaction.	
3	**Learning Skills** **3.1 Fundamentals of Learning:** Definition, characteristics and rewards of learning. Affective, cognitive and psychomotor domains of learning. Barriers in learning. FIPN analysis. **3.2 Process of Learning :** Reception, understanding, consolidation, retrieval, internalization, application, reinforcement and enhancement **3.3 Learning Skills:** Skills of observing, listening, reading, notes taking, memorizing, problem solving, graphic, experimenting, surveying, calculating skills, Cognitive skills. **3.4 Studying skills :**Planning and scheduling, Methods of study as per Nature of subject content. **3.5 Self-motivation:** Meaning and importance. Improving self-motivation through activities like inspiring case studies, web search &presentation, technical quiz/games, group studying, making videos, industry exposure	**08**
	Course Outcomes CCF201-4 Organize studying skills, self motivation for best performance.	
4	**Language Skills** 4.1 Vocabulary. Pronunciation. Spellings. Recitation. 4.2 Listening and recitation. 4.3Word games.	**06**

Course Outcomes CCF201-5 Adapt behavioral and aesthetical skills.		
5	**Aesthetic Skills** 5.1 Sense of aesthetics. Appearance. Neatness. Decency. Sense of colours and graphics 5.2 Application of aesthetics in appearance, work, note book and paper writing, submission work	**02**
Course Outcomes CCF201-6 Adapt creativity skills for doing work creativity.		
6	**Behavioral Skills** 6.1Manners and etiquettes. Discipline. Sincerity. Morales. Politeness. Social and civic sense. Assertion without aggression.	**04**
7	**Creativity Skills** 7.1 Meaning and importance of creativity. 7.2 Doing things creatively.	**04**
	TOTAL	**32**

F. TERM WORK

Practical Exercises and related skills to be developed:
The following practical exercises shall be conducted as Term Work detailed in the *Workbook on Generic Skills* developed by the Institute in practical sessions of batches of about 22 students:

Sr. No.	Title of the Lab work	Skills / Competencies to be developed	Course Outcome
1.	Introduction Game	Self-expression, inter-personal rapport	CCF201-1
2.	Concentration Skills - 1: Chanting of Omkar	Concentration	CCF201-2
3.	Concentration Skills - 2: Breathing exercises	Concentration	CCF201-2
4.	Concentration Skills - 3: Prayer	Concentration, recitation, positive thinking	CCF201-2
5.	Concentration Skills - 4: Meditation	Concentration, thought management	CCF201-2
6.	Language Skills - 1 : Vocabulary Exercise	Vocabulary improvement	CCF201-4
7.	Language Skills - 2 : Recitation Exercise	Pronunciation, language acquaintance	CCF201-3 & 4
8.	Language Skills - 3 : Grammar	Language skills	CCF201-3 & 4
9.	Learning Skills - 1 : Domain Analysis of an activity	Understanding learning domains	CCF201-3 & 4
10.	Learning Skills - 2 : FIPN Analysis of Learning	Learning analysis	CCF201-3 & 4
11.	Learning Skills - 3 : Reading and Notes taking	Effective reading and notes taking	CCF201-3 & 4
12.	Learning Skills - 4 : Listening and Notes taking	Effective listening and notes taking	CCF201-3 & 4
13.	Learning Skills - 5 : Studying Skills	Effective self-studying	CCF201-5
14.	Technical Skills - 1 : Calculating Skills	Efficient use of calculator	CCF201-5

15.	Technical Skills - 1 : Text-graphic Conversion	Graphic and language skills	CCF201-5
16.	Aesthetic Skills	Attitude of aesthetic presentation	CCF201-6
17.	Behavioral Skills	Behavior, mannerism and etiquettes	CCF201-6
18.	Creativity Skills	Attitude of creativity and innovation	CCF201-6
19.	Self-motivated Activities	Self-motivation Skills	CCF201-6

C. INDUSTRIAL EXPOSURE:
(Included in*Workbook on Generic Skills*)

SN	Mode of Exposure	Topic
1.	Self-motivated Activities	Industrial survey, information collection, Biographies of industrialists, etc.
2.	Recitation Exercises	Articles on industrial scenario and issues
3.	Domain Analysis	Analysis of field / industrial activities

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

d) Term work :

i) Continuous Assessment of Practical Assignments:

Everypractical assignment shall be assessed for 25 marks as per criteria given in *Workbook on Generic Skills*.

Domain	Particulars	Marks out of 25
Cognitive	Understanding	02
	Application	02
Psychomotor	Presentation Skills	04
	Drafting skills	05
Affective	Discipline and punctuality	06
	Decency	06
TOTAL		**25**

ii) Progressive Skill Test:

One mid-term *Progressive Skill Test* of 25 marks shall be conducted as per criteria given in *Workbook on Generic Skills*
Final marks of termwork shall be awarded as per *Assessment Pro-forma VI*

e) 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 :

Skills >	Concen-tration Skills	Language Skills	Learning Skills	Technical Skills	Aesthetic, behavioral and creativity skills	Total	Marks converted out of …
Marks >	20	20	20	20	20	100	50

INSTRUCTIONAL STRATEGIES:

InstructionalMethods:

1. Lectures cum Demonstrations 2. Classroom practices

Teaching and Learning resources:

1. Chalk board 2. LCD presentations 3. Audio presentations 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.	Kulkarni/Sharma	Independent Study Techniques	
3.	E.H.McGrath	Basic Managerial Skills for all	McGraw Hill Pub., New Delhi
4.	Sahukar&Bhalla	The book of Etiquette and Manners	Pustak Mahal, New Delhi
5.	Jeanne E.O.	Human Learning	Pearson Publishers, Mumbai
6.	Kenneth/Dubois	Learning to Learn	Pearson Publishers, Mumbai
7.	Fred Luthans	Organizational Behavior	McGraw-Hill Higher Edu.

b) Websites

i) *www.mindtools.com*
ii) *www.samcerto.com*
iii) *www.stress.org.uk*
iv) *www.yogapoint.com*

*** * ***

COURSE ID:

Course Name : COMMUNICATION SKILLS
Course Code : CCF202
Course Abbreviation : FCMS

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			Total
	Theory	Practical	Theory	Practical *	TW	
Detailsof Evaluation	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 (1½ hours)	Term End Practical Exam (2 hours)	As per Proforma II.	
Marks	**10**	**--**	**40**	**25**	**--**	**75**

** Practical Examination to be conducted by internal examiner (course teacher) and external examiner (course teacher of different classroom 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 generic 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

Psychomotor : i) Use of correct pronunciation, tone, accent & intonation ii) writing formal letters, drafts, reports etc. iii) Use of correct nonverbal code in formal & informal situations iv)Speaking in formal & Informal situations

Affective: Attitude of i) perfection ii) iii) confidence iv) punctuality v) aesthetic presentation

COURSE OUTCOMES:

CCF202-1 Identify his/her communication barriers
CCF202-2 converse and convince by speaking, deliver prepared & extempore speech
CCF202-3 write letters, reports, resume in correct language
CCF202-4 Make effective use of body language & graphic communication
CCF202-5 Prepare and present simple media aided presentation
CCF202-6 Prepare and face mock 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	Programme Outcomes POs and PSOs											
	PO 1 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan & Organize**	**PSO2 Production & Management**
Competency: Apply principles of communication for effective technical communication	3	3	3	2	2	-	2	1	1	1	2	2
CCE202-1 Identify his/her communication barriers	3	3	-	-	2	-	1	1	1	2	2	2
CCE202-2 Write letters, reports, resume in correct language	3	3	3	3	2	-	2	1	1	2	2	2
CCE202-3 Converse and convince by speaking, deliver prepared and extempore speech	2	3	3	1	1	-	2	1	1	1	2	2
CCE202-4 Make effective use of body language and graphic communication	3	3	2	2	3	-	2	1	1	2	2	2
CCE202-5 Prepare and present simple media aided presentations	3	3	2	1	3	-	2	1	1	2	2	2
CCF202-6 Prepare and face mock interview	2	2	2	-	2	-	2	1	2	2	2	2

CONTENT:
G. THEORY :

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
COURSE OUTCOME CCF202-1 Identify his/her communication barriers			
1	**Fundamentals of Communication** 1.1 Definition of communication by Newman and Peter Little. Importance communication 1.2 Modelof communication: Sender-Message-Channel-Receiver-Feedback cycle. Encoding and decoding 1.3 Principles of effective communication 1.4 Types of communication 1.5 Barriers in communication	**08**	**12**
COURSE OUTCOME CCF202-2 Converse and convince by speaking, deliver prepared & extempore speech			
2	**Oral Communication** 2.1 Principles and characteristics of oral communication. 2.2 Tone, pronunciation and accents. Grammar. 2.3 SpokenEnglish:Dialogue, conversation, prepared and extempore speech, discussion, debate, feedback	**06**	**06**
COURSE OUTCOME CCF202-3 Write letters, reports, resume in correct language			
3	**Written Communication** 3.1 Principles and characteristics of written communication. 3.2 Writing reports, letters, resume and notes.	**06**	**06**
COURSE OUTCOME CCF202-4 Make effective use of body language & graphic communication			
4	**Non-verbal communication** 4.1 Principles and characteristics of non-verbal Communication. 4.2 BodyLanguage:visual, tactile, auditory, cultural. Silence. 4.3 GraphicCommunication: Visual illustration, technical graphic communication.	**04**	**06**
COURSE OUTCOME CCF202-5Prepare and present simple media aided presentation			
5	**Media Aided Presentation** 5.1 Media aids for presentation: strengths and precautions 5.2 Planning, preparing and making a presentation 5.3 Use of presentation media: OHP, computer, MS PowerPoint,LCD, board, charts	**04**	**06**
COURSE OUTCOME CCF202-6Prepare and face mock interview			
6	**Interview Techniques** 6.1 Preparing for an interview 6.2 Taking a mock interview and facing an interview	**04**	**04**
	Total	**32**	**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.			

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 Communication	02	06	04	CCF202-1	12
2	Oral Communication	02	02	02	CCF202-2	06
3	Written Communication	02	02	02	CCF202-3	06
4	Non-verbal Communication	02	02	02	CCF202-4	06
5	Media aided presentation	02	02	02	CCF202-5	06
6	Interview Techniques	00	02	02	CCF202-6	04
	Total >>	10	16	14		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.

H. TERM WORK

Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as Term Work as detailed in the *Workbook on Communication Skills* 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.	Characteristics of Communication Process	Analysis of communication process	CCF202-1
2.	My Communication Barriers	Self analysis	CCF202-1
3.	Verbal Communication : Vocabulary	Improvement in vocabulary	CCF202-2 &3
4.	Oral Communication : Prepared Speech	Preparing and delivery	CCF202-2
5.	Oral Communication : Extempore Speech	Creative thinking and speaking	CCF202-2
6.	Oral Communication : Conversation	Listening, thinking and speaking	CCF202-2
7.	Oral Communication : Group Discussion	Listening, thinking and convincing	CCF202-2
8.	Oral Communication : Group Debate	Listening, thinking and convincing	CCF202-2
9.	Written Communication : Drafting Skills	Drafting	CCF202-3
10.	Written Communication : Writing formal and Informal Letters	Drafting	CCF202-3
11.	Written Communication : Writing Reports	Drafting with comprehension	CCF202-3

12.	Written Communication : Writing Scripts	Drafting	CCF202-3
13.	Non-verbal Communication : Graphic Communication	Graphic skills	CCF202-4
14.	Non-verbal Communication : Body Language	Body language	CCF202-4
15.	Using Presentation Aids	Using presentation aids	CCF202-5
16.	Interview Techniques	Facing interview	CCF202-6

I. INDUSTRIAL EXPOSURE:

(Included in*Workbook on Communication Skills*)

SN	Mode of Exposure	Topic
1.	Oral and Written Communication Exercises	Industrial situations
2.	Recitation Exercises	Articles on industrial scenario and issues
3.	Interview Techniques Exercises	Industrial situations

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

f) Assessment Criteria for Term work :

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	02
	Application	02
Psychomotor	Presentation Skills	04
	Drafting skills	05
Affective	Discipline and punctuality	06
	Decency	06
TOTAL		**25**

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 termwork shall be awarded as per *Assessment Pro-forma II.*

g) 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	Speech	Body Language	Language Grammar	Letter Writing	Total	Marks out of
Marks >	20	20	20	20	20	100	25

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. 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.	B.V.Pathak	Communication Skills	NiraliPrakashan
3.	Burgoon Michael	Human Communication	SAGE Publications Inc.
4.	Geofrey Leech and Jansvartvik	A communicative Grammar of English	Pearson Education ESL
5.	Elizabeth Hiemey	101 ways to better communication	Pustak Mahal
6.	Thomas Huckin and Leslie	Technical Writing and Professional Communication	McGraww Hill College Division

b) Websites

i) *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 *www*
iii) *http://www.cgg.gov.in/Handbook%20on%20Communication%20Skills.pdf*
iv) *http://www.stf-media.com/31-0-Presentations.html*

*** * ***

COURSE ID:

Course Name : PROFESSIONAL PRACTICES
Course Code : CCF203
Course Abbreviation : FPRP

TEACHING AND EVALUATION SCHEME:

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

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	01	03
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory	TW	OR	
Details and Duration	--	One mid-term Skill Test (2 hrs)	No Term End Theory Exam	As per proforma V	Oral Exam.	
Marks	--	--	--	25	50	75

** Oral 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 V.*

RATIONALE:

The course *Professional Skills* is in continuation of the courses *Generic Skills* and *Communication Skills* studied in semester I and II respectively. In order to be a successful technician in industry, a diploma holder is required to acquire certain professional skills. These skills shall be studied in this course. An overview and awareness about the world of industry has been provided in Chapter 1. Professional skills like leadership skills, team building, stress and conflict management, time management have been dealt with.

Aptitude tests have been introduced. A study of major technological projects in the respective programme discipline has been included in the syllabus. Term work assignments of the course provide the student on-field activities as well as self-learning activities providing professional exposure in order to help develop professional skills.

COMPETENCY :

Apply professional skills to solve day to day problems:

Cognitive : Develop professional skills like leadership, stress & conflict management and team building skills.

Psychomotor : Work as successful technician in industry.

Affective : Attitude of i) perfection ii) Accuracy iii) confidence iv) punctuality

COURSE OUTCOMES:

CCF203-1 Develop awareness about industrial scenario of Sugar Industry in World & India
CCF203-2 Develop professional skills like team building.
CCF203-3 Develop awareness about major industrial projects.
CCE203-4 Develop awareness about professional and behavioral ethics

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan & Organize**	**PSO2 Production & management**
Competency: Apply principles of organizational behavioral science for professional skills	2	2	-	-	-	-	1	1	1	2	2	2
CCE203-1 Develop awareness about industrial scenario of world and India	2	2	-	-	-	-	1	1	1	2	2	2
CCE203-2 Develop professional skills like leadership, stress and conflict management, team building skills	2	2	-	-	-	-	1	1	1	2	2	2
CCE203-3 Develop awareness about major industrial projects and biographies of great industrial personalities	2	2	-	-	-	-	1	1	1	1	2	2
CCE203-4 Develop awareness about professional and behavioral ethics	2	2	-	-	-	-	1	1	1	2	2	2

CONTENT:
J.THEORY :

Sr. No.	Topics / Sub-topics	Lectures (Hours)
CCF203-1 Develop awareness about industrial scenario of Sugar Industry in World & India		
1	**Industrial Development of India** 1.4 Introduction to industrial revolution in the world 1.5 Brief history of industry in India 1.6 Broad categories of industries : Manufacturing industry, service industry 1.7 Present industrial scenario of India : Small scale, medium scale and major industries in the programme discipline 1.8 Major issues related to industrialization	**04**
CCF203-2 Develop professional skills like team building.		
2	**Profession and Professional Skills** 2.1 Difference in profession, occupation, business 2.2 Leadership : definition, styles and skills 2.3 Team Building : Types of teams. Characteristics of good team and effective teamwork 2.4 Conflict management : Definition and causes of conflict. Methods of resolution - negotiating, compromising, withdrawal, forcing, engagement 2.5 Self SWOT analysis as a professional technician 2.6 Aptitude test 2.7 Emotion Management and Interpersonal Skills: Use of yogic processes like yogasanas, yog , Nidra, breathing exercises and pranayam, omkar, meditation for effective handling of emotions and interpersonal relations	**06**
CCF203-3 Develop awareness about major industrial projects.		
3	**Industrial Personalities and Major Projects** 1.1 Pioneers of Industrial development of India : Brief biography of Sir M. Visvesarrya and JRD Tata 1.2 Biography and contribution of two great industrial personalities from programme discipline 1.3 Study of 5 major technological projects in the programme discipline	**06**
	Total	**16**

K. TERM WORK

Practical Exercises and related skills to be developed:

The term work shall consist of a journal containing write ups by students on the following assignments conducted in practical sessions of batches of about 22 students :

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	
1	Information Search through internet on Industrial Scenario of India	Information search and interpretation skills	CCF203-1
2	Information Search through actual visit to MIDCs on classification of industries	Information search and interpretation skills	CCF203-1
3	Biography and contribution of two eminent industrialists from programme discipline	Information search and presentation skills	CCF203-1
4	Individual SWOT analysis as a professional technician	Self-analysis skills	CCF203-2
5	Leadereship	Leadership skills	CCF203-2
6	Stress and Conflict Management	Stress and conflict management skills	CCF203-2
7	Aptitude test	Self-testing skills	CCF203-2
8	Breathing exercises, pranayam, omkar chanting and meditation	Attaining calmness of mind and balance of emotions	CCF203-2
9	Case study of a major technological project in the programme discipline	Case study skills	CCF203-3
10	Biography and contribution of Sir M. Visverayya and J.R.D.Tata	Information search and presentation skills	CCF203-3

C. INDUSTRIAL EXPOSURE:

(Included in the contents of *Theory* and *Term work*)

SN	Mode of Exposure	Topic
1.	Theory inputs and practical survey	TW Exercise No. 1 and 2
2.	Study of biographies of industrialists	TW Exercise No. 3 and 4
3.	Case study of major industrial project	TW Exercise No. 9

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

h) Assessment Criteria for Term work :

i) Continuous Assessment of Practical Assignments:

Every practical assignment shall be assessed for 25 marks

ii) Progressive Skill Test:

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

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

i) Term End Oral Examination :

Term-end Oral Examination shall be conducted by internal examiner (course teacher) and external examiner (course teacher of different class from the Institute).

INSTRUCTIONAL STRATEGIES:

Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices

Teaching and Learning resources:

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

REFERENCE MATERIAL :

a) Books / Journals / IS Codes

Sr. No.	Author	Title	Publisher
1.	EH McGrath, SJ	Basic Managerial Skills for all	McGraw Hill
2.	Prakash Iyer	The Secret of Leadership : Stories to Awaken, Inspire and Unleash the Leader Within	

b) Websites

i) *en.wikipedia.org/wiki/Leadership*

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COURSE ID:

Course Name : COMPUTER PROGRAMMING
Course Code : SMF 205
Course Abbreviation : FCOP

TEACHING AND EVALUATION SCHEME:

Pre-requisites: NIL

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	1	05
Practical	4	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		Total
	Theory	Practical	Practical	Term work	
Duration	Two tests (1hour each)	One practical (2hours)	One practical (2 hours)	As per proforma V	
Marks	NA	--	50	50	100

* Assessment as per Pro-forma-III.

Rationale:

This course intends to expose a student to the basic principles of programming through a structured programming language like 'C'. 'C' being most commonly used structured programming language having powerful features will certainly help development of logical thinking abilities of the technician. It will also help the students to develop the required programs in this language in area of Sugar Engineering curriculum. Study of this course would enable the student to learn any advanced object oriented language.

COMPETENCY: Applying logic to develop logical thinking ability of a technician is as follows:

Cognitive: Understand application of 'C' Programming for the development of logical thinking to solve engineering problems.

Psychomotor: i) logical skills ii) programming skills iii) Drafting skills

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

COURSE OUTCOMES:

SMF205-1 Analyze the 'C' programming language.
SMF205-2 Analyze the 'C' fundamentals of used in C programming.
SMF205-3 Understand the use of logical statements.
SMF205-4 Analyze the use of array in C programming.
SMF205-5 Analyze the use of string function into C programming.
SMF205-6 Comprehend the file management in C programming.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying logic to develop logical thinking ability of a technician	2	1	2	1	1	--	--	--	1	1	1	1
SMF205-1 Analyze the 'C' programming language.	2	1	2	1	1	--	--	--	1	1	2	1
SMF205-2 Analyze the 'C' fundamentals.	2	1	2	1	1	--	--	--	1	1	1	1
SMF205-3 Understand the use of logical statements.	2	1	2	1	1	--	--	--	1	1	2	2
SMF205-4 Analyze the use of array.	2	1	1	1	1	--	--	--	1	1	-	-
SMF205-5 Analyze the use of string function.	2	1	1	1	1	--	--	--	1	1	-	-
SMF205-6 Comprehend the file management in C programming.	2	1	2	1	1	--	--	--	1	2	1	1

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Sr. No.	Topics	Teaching (Hours)	Theory evaluation (Marks)
Course Outcome: SMF205-1 Analyze the 'C' programming language.			
1.	**INTRODUCTION** 1.1 Problem, definition and analysis. 1.2 Algorithms: Tracing and Dry running algorithms 1.3 Flow charts flow charting examples. 1.4 Introduction to 'C' programming. 1.5 Simple computer program using Turbo 'C' compiler and execution of 'C' program.	**02**	**N.A.**
Course Outcome: SMF205-2 Analyze the 'C' fundamentals of used in C programming.			
2.	**C FUNDAMENTALS** 2.1 Character set, Constants, Data Types, Identifiers, Key Words, Variable declarations. 2.2 Types of Operators: Unary, Binary, Arithmetic, Relational, Logical assignment. 2.3 Hierarchy of operators, Expressions, Library functions, Use of input /output functions viz. Printf(), scanf(), getch(), putch()	**03**	**N.A.**
Course Outcome: SMF205-3 Understand the use of logical statements.			
3.	**USE OF CONTROL STATEMENTS** 3.1 if-else, while loop, do-while loop, for loop, switch break and continue. 3.2 Writing, Compiling, executing and debugging programs.	**03**	**N.A.**

Sr. No.	Topics	Teaching (Hours)	Theory evaluation (Marks)
Course Outcome: SMF205-4 Analyze the use of array in C programming.			
4.	**ARRAYS** 4.1 Introduction to subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and Writing.	**03**	**N.A.**
Course Outcome: SMF205-5 Analyze the use of string functions into C programming.			
5.	**STRING FUNCTIONS** 5.1 Concept of string, string input/output functions. 5.2 Defining and accessing a user defined functions, Passing of arguments, declaration of functions prototypes.	**03**	**N.A.**
Course Outcome: SMF205-6 Comprehend the file management in C programming			
6.	**LE MANAGEMENT IN 'C'** 6.1 Introduction. 6.2 Defining and opening a file. 6.3 Closing a file. 6.4 Input/ Output Operations on files	**02**	**N.A.**
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

N.A

Laboratory experiences and related skills developed.

Sr. No.	Laboratory experience	Skills developed	CO
1.	Study of Flow charts and Algorithm	Understanding algorithm, flowcharts and symbols.	SMF205-1
2.	Character set and Operators.	Detail study of character set of C language, Understanding operator and its types.	SMF205-1
3.	Valid and invalid identifiers, variables	Understanding an identifiers, variables, constants and keyword.	SMF205-2
4.	Study of control statements	Understanding use of conditional and unconditional branching, syntax, use f go statement, forward and backward jumping.	SMF205-3
5.	Study of control structure	Understanding the necessity, types, syntax and flow chart.	SMF205-3
6.	Study of control structure: Switch statement	Use of switch statement, syntax, flow chart, significance of break statement in it.	SMF205-3
7.	Study of FOR statement	Definition of loop, syntax, flow chart, execution of FOR loop.	SMF205-3
8.	Study of while loop.	Exit control and entry control loop, syntax, flow chart and execution of while loop.	SMF205-3
9.	Study of do-while loop	Exit control and entry control loop, syntax, flow chart and execution of do-while loop. Use of nested do-while loop.	SMF205-3
10	Study of function	Understanding function, declaration, syntax and function call.	SMF205-3
11	Study of an array	Understanding and use of array, size and syntax, read and print the elements of an array.	SMF205-4
12	Study of two dimensional array	Understanding and use of array, size and syntax, read and print the elements of 2-D array.	SMF205-4
13	Study of strings using arrays	Understanding string, declaration of string array.	SMF205-4
14	Study of standard string function	Understanding syntax and use of strcat(), strlen(), strcmp(), strcpy().	SMF205-5
15	Study of simple structure	Understanding size and syntax of structure, declaration and use of variable structure.	SMF205-5
16	Study of file	Read and Write to/from the file.	SMF205-6

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

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

* Assessment as per Pro-forma-III.

Instructional strategies:

1) Lectures and discussions.
2) Laboratory experiences and laboratory interactive sessions.
3) Time bound assignments.

Teaching and Learning resources, including references:

1) Chalk-board.
2) Demonstrative kits.
3) Demonstrative charts.
4) **Books:**

Sr. No.	Author	Title	Publication
1.	E. Balguruswamy	Programming in 'C'.	Tata Mc-Graw Hills, India.
2.	Yashwant Kanitkar	Let us 'C'.	BPB Publications.
3.	V. Rajaraman	Computer Programming in C'.	PHI Publications.PHI Publications.
4.	Edward B. Toupin	Easy Programming with 'C'.	QUE Corporation.

LEVEL – III

COURSE ID:

Course Name : SUGAR FACTORY PRACTICES
Course Code : SMF 301
Course Abbreviation : FSFP

TEACHING AND EVALUATION SCHEME :

Pre-requisite Course(s) : NIL

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	0	04
Tutorial	4	

Evaluation Scheme:

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral Examination)	
Details of Evaluation	Average of two tests of 20 marks each	i. 25 marks for each practical ii. One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma	As per Proforma	
Marks	**00**	**50***		**25***	**25***	**100**

RATIONALE:

In Institute for the convenience of the students total knowledge is divided in number of subject and that two in some sequence. Similarly there are many concepts, principles which can be understood properly if their field applications are demonstrated to the learner. But in industries there are no subjects but only the applications of various subjects in an integrated manner is applied to find the solution of the problems.

In the context the above, field visits are essential to encourage and satisfy the curiosity of the students about their role in industry and to help them to strengthen the theoretical knowledge gained by them during the class room instructions.

This course is basically introduced to observe industrial practices in the live situation and to develop awareness about the present need of the industry in terms of competencies and technical abilities.

Since the field visits are the part of curriculum learning (processes) the situation for industrial visits are identified from curriculum.

COMPETENCY:

To encourage & satisfy the curiosity of students about their role in industry by actual factory visit.

Cognitive: Understand the concept and principles by actual observations during visits.

Psychomotor: Operate and understand the arrangements of the machineries.

Affective: Attitude of 1) precision 2) accuracy 3) Safety 4) punctuality.

COURSE OUTCOMES:

SMF301-1 Understand cane plantation, maturity & harvesting.
SMF301-2 Understand process flow chart with specification of machinery.
SMF301-3 Understand milling by observation of mill section devices.
SMF301-4 Understand and explain internal arrangement of boiler.
SMF301-5 Explain arrangement of boiling house machinery.
SMF301-6 Explain storage of sugar, ETP, various pumps, valves and gauges.

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	Program Outcomes POs and PSOs											
	PO 1 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Organize	PSO2 Production & Management
Competency	2	2	2	-	-	-	-	2	2	2	2	2
SMF301-1	2	2	2	-	-	-	-	2	2	2	2	2
SMF301-2	2	2	--	-	-	-	-	2	2	2	2	2
SMF301-3	2	2	2	-	-	-	-	2	2	2	2	2
SMF301-4	2	2	2	-	-	-	-	3	2	2	2	2
SMF301-5	2	2	--	-	-	-	-	2	2	2	2	2
SMF301-6	2	2	--	-	-	-	1	2	2	1	2	2

CONTENT: A.THEORY:

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome SMF301-1 Understand cane plantation, maturity & harvesting.			
1	**Plantation, Harvesting & Maturity**(Field Visit) 1.1 Plantation of sugar cane 1.2 Methods of determining maturity of cane, pre-harvesting maturity survey 1.3 Harvesting by different methods.	**02**	**--**
Course Outcome SMF301-2 Understand process flow chart with specification of machinery.			
2	**Plant flowchart & equipments** 2.1 Sugar manufacturing flow chart 2.2 List out equipments station wise 2.3 Engineering specification of sugar industry as per I-1 form: - Mill house, boiler, Boiling house equipment. 2.4 Plant layout:-Sketches 2.5 By-product units	**03**	**----**
Course Outcome SMF301-3 Understand milling by observation of mill section devices.			
3	**Mill section** 3.1 Crane unloading, cane carrier, cane preparatory Devices, Mills, RBC, Imbibition & Turbine drive	**02**	**----**
Course Outcome SMF301-4 Understand and explain internal arrangement of boiler.			
4	**Boiler** 4.1 Water tube boiler bagasse fired 4.2 Boiler furnace, Air pre-heater, superheater, Boiler mountings & Economizer	**02**	**---**

Course Outcome SMF301-5 Explain arrangement of boiling house machinery.			
5	**Boiling house equipments** 5.1 Juice/Water weighing scale 5.2 Juice heater, Juice sulphitation tank, clarifier, Evaporator, Syrup tower 5.3 Pan, Crystallizers, centrifugal machines, Hopper Grader & Elevator	**04**	**---**
Course Outcome SMF301-6 Explain storage of sugar, ETP, various pumps, valves and gauges.			
6	**Godown, Pumps & Gages** 6.1 Godown, Spray pond, Effluent treatment plant 6.2 Pumps & Valves 6.3 Gauges:- pressure, Vacuum & Temperature.	**03**	**-----**
	Total	**16**	**-----**
Students have to submit a Report / Assignment in the form of Journal **and** Perform 'Practical Activity' and face Viva-voce at the end of Term on the above Topics.			

Work and Semester End Practical Exam:

Sr. no	Criteria	Continuous Assessment	Progressive Skill Test	Performance of Term End
1	Attendance	15	02	05
2	Preparedness and Involvement in Practical	10	03	05
3	Correct figures / Diagrams/ Neatness/Presentation	8	06	05
4	Result/Table / Calculations / Graphs/Observations	7	06	05
5	Safety / Use of Proper Tools / Workmanship.	10	08	05
	Total Marks	**50**	**25**	**25**

B.PRACTICALS

i. Practicals are to be used to get enough practice [One batch for 15 Students]

Sr No.	Topic	Tutorial Content (10 problems in each tutorial)	CO
1	Plantation, Harvesting & Maturity	Measurement of brix by hand refractometer	SMF301-1
2	Plant flowchart & equipments	Draw process flow chart of sugar manufacturing process	SMF301-2
3	Mill section	Draw neat sketches of tree roller milling tandem & compound imbibitions system used in mill tandem.	SMF301-3
4	Boiler	Analyze boiler water & boiler feed water	SMF301-4
5	Boiling house equipments	Draw neat sketches of Pan, Evaporator, Juice heater & Clarifier.	SMF301-5
6	Godown, Pumps & Gages	Draw the different pumps used in sugar industry	SMF301-6
7		Draw the different valves used in sugar industry	
8		Study the various gauges used in sugar industry	
9		Study effluent treatment plant in sugar industry	

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practicals	05
2	Preparedness for practicals	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

C.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.	Patel, Rawal,	Applied Mathematics	Nirali Prakashan,Pune
3.	P.M. Patil and others	Applied Mathematics	Vision Publication, Pune
4.	Sameer Shah	Applied Mathematics	Tech-Max Publication, Pune
5.	P.N. Wartikar	Higher engineering mathematics	Pune vidyarthi Griha Prakashan , Pune
6.	H .K .Dass	Applied mathematics	S .Chand publication
7.	B .S Grewal	Higher engineering Mathematics	Khanna publication, New Delhi

b) Websites
i) www.khanacademy.org
ii) www.easycalculation.com
iii) www.math-magic.com

COURSE ID:
Course Name : BASIC SUGAR ENGINEERING
Course Code : SMF 302
Course Abbreviation : FBSE

TEACHING AND EVALUATION SCHEME:
Pre-requisites: NIL

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	04	06
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL*	T W	
Marks	20 each	--	80	25	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

Sugar Production Manager have to work with various power producing & power absorbing devices like Mills, Boilers, Turbines, Pumps etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the elements of Sugar Engineering, which is a core subject. It includes the study of various basic laws & concept of thermodynamics, gas laws, properties of steam & generation. Boilers find application in different process industries. This subject dealt with working principle and application of these devices.

COMPETENCY: Apply the knowledge of thermodynamics in various power producing & power absorbing devices.
Cognitive:.1)Understand fundamental concept and application of varies laws of thermodynamics.
2) Understand feeding devices, Grooving, Mill setting &bagasse furnaces.
Psychomotor:. Handling of mill equipments & cane preparatory devices.
Affective: Attitude of 1) precision 2) accuracy 3) Safety.

COURSE OUTCOMES:

SMF302-1.Classify thermodynamic system &explain different laws of thermodynamics.
SMF302-2 Differentiate & explain different thermodynamic cycles.
SMF302-3 Explain different thermodynamic process.
SMF302-4 Explain cane preparatory, feeding devices &grooving.
SMF302-5 Explain varies properties of steam.
SMF302-6 Explain boiler mountings, accessories &steam cycle in sugar industry.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	2	-	-	-	-	-	2	1	2	2	2
SMF302-1	2	1	-	-	-	-	-	1	1	1	1	1
SMF302-2	2	1	-	-	-	-	-	1	1	1	1	2
SMF302-3	2	2	-	-	-	-	-	2	1	2	2	2
SMF302-4	2	2	-	-	-	-	-	2	1	2	2	2
SMF302-5	1	1	-	-	-	-	-	2	1	2	2	2
SMF302-6	2	2	-	-	-	-	-	2	1	2	2	2

Section I

Sr. No.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	Course Outcome SMF302-1.Classify thermodynamic system &explain different laws of thermodynamics.		
1	**FUNDAMENTAL CONCEPT** 1.1 Different Terms used in Thermodynamics, Working Substance, Surrounding, Thermodynamic System (Open, Closed and Isolated). 1.2 Classification of Thermodynamic System: Homogeneous& heterogeneous System, process,cycle. 1.3 State and Properties of System. 1.4 Concept of Energy (PE, KE, IE). 1.5 Steady flow energy equation. 1.6 Enthalpy, Entropy, Specific Heat, Work and Heat,	06	08
	LAWS OF THERMO DYNAMIC 1.7 Explanation of Law number Zero and First Law of Thermodynamic, Second Law of Thermodynamic (Kelvin Plank & Clausius Statement), 1.8 Application of Laws of Thermodynamic to Non Work Developing and Not Work Absorbing System: like Boiler and Condenser, to Work Developing System: like Turbine, to Work Absorbing System: like Pump or Compressor, to Nozzle, Heat Pump. 1.9 Application of second Laws of Thermodynamic to refrigerator &heat pump.	08	10
	Course Outcome SMF302-2 Differentiate & explain different thermodynamic cycle		
2	**THERMODYNAMIC CYCLES** 2.1 Assumption, Classification of Reversible & Irreversible Cycles. 2.2 Relation between Cycle & Engine. 2.3 Working of an Ideal Engine, Air Standard Efficiency, 2.4 Important Terms used in Thermodynamic Cycles. 2.5 Carnot Cycle with steam as a working substance. 2.6 Rankin cycle. 2.7 Performance criteria for Thermodynamic Vapor Cycle. 2.8 Comparison of Carnot and Rankin Cycle, 2.9 Assumptions made in the analysis of air standard cycles.	10	12

Course Outcome SMF302-3 Explain different thermodynamic process.			
3	IDEAL GAS PROCESSES 3.1Perfect Gas Laws: Boyle's laws, Charles's law. 3.2 Perfect gas equation. 3.3Gas Constant, Universal Gas constant. 3.4Reversible & Irreversible Processes. 3.5Classification of Thermodynamic Processes. 3.6 Heating and expansion of gases in Non-flow processes, Constant volume(Isochoric), Constant pressure (Isobaric), Constant Temperature (Isothermal), Adiabatic(Isentropic), Hyperbolic and Polytrophic, Presentation of the above processes on pressure	08	10
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Section II

Sr. No.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course Outcome SMF302-4 Explain cane preparatory, feeding devices &grooving			
4	**CANE PREPARATION** 4.1 Unloading the cane: Feeder Tables, Cane Carriers construction, 4.2 Method of Drive. 4.3 Objects of Cane Preparation. 4.4 Effect of Cane preparation. 4.5 Cane Preparatory Devices: (Revolving Knives, Shredders /Fiberizer), Construction and Maintenance.	06	08
	MILLING 4.6 Principle of Milling. 4.7 Three Roller Mill Unit . 4.8 Feeding devices(Over feed Roller, Underfeed Roller, Pressure Feeder, Chutes). 4.9 Grooving: Circumferential Grooves, Messchaert Grooves, Chevron Grooves. 4.10 Method of Drive. 4.11 Intermediate Carriers. 4.12 Object and Importance of Mill setting. 4.13 Factors affecting Mill Operation, 4.14 Definitions: Mill setting, Work Opening, Set Opening, Mill Ratio, Fiber Index, Turner Plate Setting, Capacity, Extraction, Hydraulic Loading, Speed of Mill.	10	12

Course Outcome SMF302-5 Explain varies properties of steam.			
5	**PROPERTIES OF STEAM** 5.1 Enthalpy of Water, Wet Steam, Dry Steam, Dry Saturated Steam, Superheated Steam ,Dryness Fraction, Enthalpy of Wet, Dry Saturated & Superheated Steam, Enthalpy of evaporation. 5.2 Application &advantages of Superheated Steam. 5.3 External Work done during evaporation. 5.4 Internal energy of Steam, Entropy, Specific Volume, Steam Table,. 5.5 Mollier Chart. 5.6 Temperature Entropy Diagram. 5.7 Formation of steam under constant pressure. 5.8 Formation of steam under constant pressure on Temperature Enthalpy Diagram.	06	08
Course Outcome SMF302-6 Explain boiler mountings, accessories &steam cycle in sugar industry			
6	**STEAM GENERATION AND USE** 6.1 Bagasse as a Fuel. 6.2 Types of Furnace and Grates. 6.3 Features of a typical bagasse furnace. 6.4 Boiler Draught,. 6.5 Fire tube and Water Tube Boiler. 6.6Boiler Accessories. 6.7 Boiler Feed Water& boiler water. 6.8 Air Heaters, Economizers. 6.9The Steam Cycle and Uses of steam(Live, Exhaust, Vapour) in Sugar Industry. 6.10 Energy Profile and energy consumption (in brief) and benefits of energy efficiency in Sugar Industry.	10	12
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Specification table for setting question paper for semester end theory examination

Section / Topic	Name of topic	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Appli.	
I/1	FUNDAMENTAL CONCEPT	SMF301-1	04	02	02	08
	LAWS OF THERMODYNAMIC		02	04	04	10
I/2	THERMODYNAMIC CYCLES	SMF301-2	02	04	06	12
I/3	IDEAL GAS PROCESSES	SMF301-3	02	04	04	10
II/4	CANE PREPARATION	SMF301-4	02	04	02	08
	MILLING		04	04	04	12
II/5	PROPERTIES OF STEAM	SMF301-5	02	04	02	08
II/6	STEAM GENERATION &USE	SMF301-6	04	04	04	12
			22	**30**	**28**	**80**

Laboratory experiences and related skills developed.

Sr. No	Laboratory experience	Skills developed	CO
1	Study of various thermodynamic cycles and gas processes with presentation of the varies processes on pressure volume (P-V) & Temp entropy (T-S) diagram.	Know & interpret steam tables, Mollier chart and relationship between different thermodynamic properties.Know the relation between cycle and engine.	SME302-1
2	Study of construction and working of various Cane preparatory Devices.	Know the function, working principle and use of Cane preparatory Devices.	SME302-4
3	Study of construction and working of Three Roller Mill used in Sugar Industry.	Understand the working principle and use of Mill Tandem and Accessories. Know the location and function of each part.	SME302-4
4	Study of construction and working of water tube Boilers by visiting a nearby Sugar Industry.(OR Demonstration of construction and working through models)	Tracing the path of flue gasses, water and steam circuit in a boiler. Know the location & function of each part. Understand the concept of steam generation.	SME302-6
5	Study of Boiler Mountings and Accessories by visiting a nearby Sugar Industry.(OR Demonstration of construction and working through models / available training aids)	Understand the working principle and use of Boiler Mountings and Accessories. Know the location and function of each part.	SME302-6
6	To study the Steam Cycle in Sugar Industry.	Understand the Steam Cycle and Uses of steam(Live, Exhaust, Vapor) in Sugar Industry.	SME302-6

Criteria forAssessment : Practical Work and Semester End Practical Exam:

Sr. no	Criteria	Continuous Assessment	Progressive Skill Test	Performance of Term End
1	Attendance	30	02	05
2	Preparedness and Involvement in Practical	20	03	05
3	Correct figures / Diagrams/ Neatness/Presentation	15	06	05
4	Result/Table / Calculations / Graphs/Observations	15	06	05
5	Safety / Use of Proper Tools / Workmanship.	20	08	05
	Total Marks	100	25	25

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.

Teaching and Learning resources, including references:

1. Chalkboard.
2. Demonstrative kits and charts.
3. Video clips/Animation/Power point presentation
4. OHP and LCD Projector
5. Internet Source: www.howstuffworks.com

Books:

Sr. No.	Author	Title	Publication
	P. K. Nag	Engineering Thermodynamics	Tata McGraw Hill
1	B. B. Jdhav, J D Kharche & Mrs V B Kulkarni	Thermal Engineering	Central Techno, Nagpur
2	E Hugot	Handbook of Cane Sugar Engg.	Tata McGraw Hill
3	D P Kulkarni	`Cane Sugar Manufacturing In India	STA Publication, Delhi
4	Mangal _Singh	Training manual For Sugar Mills	Somayya Publication, Delhi

COURSE ID:

Course Name : BASIC SUGAR MANUFACTURING
Course Code : SMF 303
Course Abbreviation : FBSM

TEACHING AND EVALUATION SCHEME:

Pre-requisites : None.

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	3	6
Practical	3	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		Total
	Theory	TW	TH	PR	
Duration	Two Tests (1hour each)	One Practical (2hours)	One Paper (3 hours)	2 Hours	
Marks	20	25	80	25*	150

* Assessment as per Pro-forma IV & VI.

Rationale:

Technology of manufacture of Sugar includes mechanical, chemical processes as well as various unit operations: such as Extraction of juice, Milling, Juice heating Clarification Methods, Preparation of clarifying Agent etc. Basic Sugar technology is basically dealt with basic definitions ,working of refractrometer, polarimeter.

This course includes the reactions involved in clarification process and effect of heat, alkali, sulfur dioxide on juice. This course also dealt with amino acids and colloids. Which helps the Students to study role of these acids in sugar manufacturing, Different methods of analysis and terminologies in the process is also studied.

COMPETENCY: Determine Bx, Pol, and Pty by polarimeter & Refractometer .Classify clarification method.

Cognitive: Understanding Definition, use of polarimeter & Refractometry & various clarification process.
Psychomotor: Handling polarimeter & refractometer, classify clarification process.
Affective: Attitude of 1) precision 2) accuracy 3) Safety.

COURSE OUTCOMES:

SMF303-1 Determine purity of sample. Explain definitions.
SMF303-2 Explain composition of juice & effect of acid, alkali, pH & heat on it.
SMF303-3 Explain effect and Role of Amino acid, Phosphoric Acid,& collides, Determine Reducing Sugar.
SMF303-4 Explain the concept of extraction of juice & classification of steam.
SMF303-5 Explain the Aim & Mechanism of clarification.
SMF303-6 Explain the concept of clarification technique & use of different clarifying agent.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency Determine Bx, Pol, Pty by polarimeter & Refractometer. Classify clarification method.	2	2	2	-	-	-	2	1	2	3	2	2
SMF 303-1 Determine purity of sample. Explain definitions	2	2	2	-	-	-	2	2	1	1	2	2
SMF303-2 Explain composition of juice & effect of acid, alkali, pH & heat on it.	2	2	1	-	-	-	2	2	2	2	2	2
SMF303-3 Explain effect and Role of Amino acid, Phosphoric Acid,& colloids, Determine R.S..	2	2	2	-	-	-	-	2	1	2	2	2
SMF303 -4 Explain the concept of extraction of juice & classification of steam.	2	2	1	2	-	-	2	2	2	1	2	2
SMF303-5 Explain the Aim & Mechanism of clarification	2	2	2	2	-	-	2	2	2	1	2	2
SMF303 -6 Explain the concept of clarification technique & use of different clarifying agent	2	2	2	2	-	2	2	2	2	1	2	2

Section I

Sr. no.	Topics/ Subtopics	Teaching (Hours)	Theory Evaluation Marks
COURSE OUTCOME: SMF303-1 Determine purity of sample. Explain definitions.			
1	**BASIC DEFINITIONS:** 1.1 Cane, Bagasse , primary Juice, Mixed juice, Last mill Juice Last expressed juice, First expressed juice ,primary juice, Secondary juice, Clarified juice, Filtered juice, pH, Added water ,Condensate ,Imbibation ,Fiber.	**03**	**04**
	REFRACTROMETRY 1.2 Refraction, Refractive Index, 1.3 Working principle and construction of Hand refractometer, 1.4 Application and importance of refractrometer in Sugar Industry.	**04**	**08**
	POLARIMETRY 1.5 Introduction, Polarize light and plane of polarization. 1.6 Nicol Prism, rotation of plane of polarization. 1.7 Working principle and construction of Polorimeter and Saccharimeter. 1.8 Polarization, Optical system of poloriscope, Practical consideration while operating poloriscope, 1.9 Sugar Scale, Normal weight of Sugar, Optical Method of Sugar analysis.	**06**	**10**
COURSE OUTCOME:SME303-2 Explain composition of juice & effect of acid, alkali, pH & heat on it.			
2	**SUGAR CANE JUICE** 2.1 Composition of cane and cane Juice. 2.2 Colour formation in the process of sugar manufacturer, Composition of Coloring matters 2.3 Effect of poor quality sugar cane, Effect of heat, alkali, acids, pH & Sulfur dioxide on juice.	**06**	**10**
COURSE OUTCOME:SMF303-3 Explain effect and Role of Amino acid, Phosphoric Acid,& collides, Determine Reducing Sugar.			

3	**ROLE OF AMINO ACIDS, PHOSPHORIC ACID AND COLLOIDS** 3.1 Amino acids and their role in sugar manufacturing Colloidal States. 3.2 colloidal solution, properties, Coagulation, true solutions, application of Colloidal Chemistry 3.3 Phosphoric acid and its preparation tank. 3.4 Effect of non sugars and reducing sugars on the process of sugar manufacture.	**05**	**08**
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	Teaching (Hours)	Theory Evaluation Marks
COURSE OUTCOME: SMF303-4 Explain the concept of extraction of juice & classification of steam.			
4	**EXTRACTION OF JUICE** 4.1 Importance of cane preparation, Extraction of cane juice by Milling, Imbibitions(simple and compound). 4.2 Importance of Mill sanitation , Mill Cleaning and Screening of juice. 4.3 Need of Water and juice weighing, Classification of steam consuming units of a sugar factory.	**05**	**08**
COURSE OUTCOME: SMF303-5 Explain the Aim & Mechanism of clarification.			
5	**CLARIFICATION** 5.1 Aim and Mechanism of Clarification, Terms involved in Clarification of juice, Chemicals used in clarification process. 5.2 Role of pH, Temperature and reaction time. 5.3 Precaution to be taken while operating clarification process. 5.4 Effect of clarification on the constituents of cane juice. 5.5 Effect of poor quality sugar cane . 5.6 Reaction taking place during the clarification, neutralizing effect.	**07**	**12**
COURSE OUTCOME: SMF303-6 Explain the concept of clarification technique & use of different clarifying agent.			
6	**CLARIFICATION TECHNIQUES** 6.1 Methods Of Clarification, Liming and Sulphitation. 6.2 Sulphitation Tank, Recovery of residual SO_2 Gas. 6.3 New techniques in Clarification process used in industry: Filtrate and Syrup Clarification.	**07**	**12**
	CLARIFYING AGENTS 6.4 Additives to aid clarification: soluble phosphate, Flocculants etc. 6.5 Clarifying agents: Lime, Sulfurous acid, Phosphoric acid. 6.6 Preparation of milk of lime and SO_2 Gas, Combustion of sulphur.	**05**	**08**
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	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	BASIC DEFINATIONS	SMF303-1	02	02		**04**
	REFRACTROMETRY		02	02	04	**08**
	SUGAR CANE JUICE		04	04	02	**10**
I / 2	POLARIMETRY	SMF303-2	02	04	04	**10**
I / 3	ROLE OF AMINO ACIDS AND COLLOIDS	SMF303-3	02	04	02	**08**
II/4	EXTRACTION OF JUICE	SMF303-4	02	02	04	**08**
II/5	CLARIFICATION	SMF303-5	02	04	06	**12**
II/6	CLARIFICATION TECHNIQUES	SMF303-6	02	04	06	**12**
	CLARIFYING AGENTS		02	04	02	**08**
			20	30	30	**80**

Laboratory Experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
1	To determine pH by pH meter.	SMF303-5	Student will develop the skill of: 1) Handling and using the Ph meater. 2) Filling the cylinder, which should be perfectly vertical. 3) Taking the reading by keeping eyes in line with the plane surface of liquid. 4) Noting the temperature of the liquid from the thermometer. 5) Reading the Brix and Temperature correction table 6) Handling and using the Polorimeter / Saccharimeter 7) Checking the zero point of the poloriscope. 8) Reading the scale and noting the polarization reading 9) Using the quartz plates of different range 10) Applying the scale correction based on quartz plate readings to be applied to all polarization reading 11) Reading the table indicating pol percentage 12) Using the pol tube of various size 13) Handling and using the pH meter, Test paper, Hellige comparator etc.
2	Determination of pH by Test Papers, pH Indicator, Hellige Comparator.		
3	To determine the Brix & purity of clear juice.	SMF303-2	
4	To determine the Brix & purity of syrup.		
5	To determine the pol &moisture% of filter cake..	SMF303-2	
6	To determine the pol & moisture% of bagasse.		
7	To determine the sugar test of condensate.	SMF303-4	
8	To determine the CaO contained in given sample of juice by EDTA method.	SMF303-5	
9	Determine ash % in sulphur.	SMF303-5	

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practicals	05
2	Preparedness for practicals	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.
4. Factory Visits.

Teaching and Learning Resources, including References of Books:

1. Chalk & Black-Board
2. O.H.P.
3. Slides
4. Video Films.

Books:

1) Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
2) Introduction to Cane Sugar Technology -By Jenkins.
3) Handbook of Cane Sugar Technology -By Spencer & Meade.

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	05
2	Observation tables	05
3	Result table / calculations / graphs	10
4	Use of Equipments properly	05
		25

Assessment for Semester End Practical Exam will be as per Pro-forma V and VI.

COURSE ID :

Course Name : INTRODUCTION TO SUGAR MANUFACTURING
Course Code : SMF304
Course Abbreviation : FISM

TEACHING AND EVALUATION SCHEME:

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

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	03	06
Practical	03	

Evaluation Scheme :

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	ORAL	
Details of Evaluation	Average of two tests of 20 marks each	25 marks for each practical	Term End Theory Exam (03 hours)	As per Proforma-V	2 Hours Proforma-VI	
Marks	**20**	**--**	**80**	**25**	**25**	**150**

RATIONALE:

Sugarcane & Sharkara are known to India since Vedic Times. It is from India that knowledge of sugarcane culture. Production & use of sugar spread over to different parts of the world. Sugar cane, a cash crop, planted in large area of Maharashtra state. Sucrose is bring into being in the sugar Cane Plant in the farm & extracted in Industry. The sucrose percentage (Pol % cane) in cane is found more in the south zone Maharashtra. In Sugar Manufacturing Process Sugar synthesized first & it is then crystallized out.

This course includes the elementary aspects like raw material, process flow, and method of analysis, terminologies & inputs involved in the process of manufacturing of sugar. In the context of understanding the Sugar Technology in higher semester study of this course has paramount importance.

COMPETENCY: To develop knowhow fundamental aspects of sugar manufacturing.

Cognitive: 1) Understand the sugar industry scenario, comprehend the methods of cane cultivation & harvesting .
2) Understand purpose & function of equipments involved in sugar manufacturing process.

Psychomotor: 1) Draw flow diagram.
2) Handling basic laboratory equipments .

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

COURSE OUTCOMES:

SMF304-1-Explain an Indian sugar industry scenario & composition of cane juice.

SMF304-2-Explain basics of plantation, cane harvesting, pre maturity survey & factors affecting maturity of cane.

SMF304-3-Explain physical &chemical properties, molecular formula &biosynthesis of sucrose

SMF304-4-Draw & explain flow diagram of sugar manufacturing process.

SMF304-5-Know & recognize equipments used in sugar manufacturing process.

SMF304-6- Analyze and Determine various parameters of juice, jaggery &molasses.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize.**	**PSO2 Production and Manage-ment.**
Competency: To develop knowhow fundamental aspects of sugar manufacturing.	2	2	2	-	-	-	-	2	2	2	2	2
SMF304-1- Explain an Indian industry scenario & composition of cane juice. .	2	2	2	-	-	-	-	2	2	2	2	2
SMF304-2- Explain basics of plantation, cane harvesting , pre maturity survey & factors affecting maturity of cane.	3	3	2	2	-	-	-	2	2	2	2	2
SMF304-3-Explain physical &chemical properties, molecular formula & bio-synthesis of sucrose	2	2	2	-	-	-	-	2	1	2	2	2
SMF304-4-Draw & explain flow diagram of sugar manufacturing process.	2	2	-	-	-	-	-	-	-	1	2	2
SMF304-5-Know & recognize equipments used in sugar manufacturing process.	2	2	1	-	-	-	-	2	2	2	2	2
SMF304-6- Analyze and Determine various parameters of juice, jaggery &molasses.	2	2	2	-	-	-	-	2	2	2	2	2

CONTENT :
A)THEORY:

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
Course Outcome **SMF304-1-** Explain an Indian sugar industry scenario & composition of cane juice.			
1	SUGAR INDUSTRY HISTORY & SUGAR CANE 1.1 Historical of sugar cane, Indian cane sugar industry scenario 1.2 Present status of world sugar industry 1.3Definations : Raw sugar, Refined sugar, Plantation White sugar. 1.4 Sugar factories in Kolhapur district, Sugar producing States & Countries. 1.5 Sugar cane plant-stem joint, bud, leaf, roots. 1.6 Cane varieties. 1.7 Composition of sugar cane &cane juice 1.8 Coloring matters present in cane juice, color of cane Juice.	12	18
Course Outcome **SMF304-2-** Explain basics of plantation, cane harvesting ,pre maturity survey & factors affecting maturity of cane.			
2	PLANTATION, HARVESTING & MATURITY 2.1 Sugar cane cultivation in Maharashtra , Preparatory tillage, Inter cultivation. 2.2 Factors affecting Germination ,Tillering &growth of sugar cane. 2.3Maturity or Ripening of Sugar cane. 2.4Harvesting of sugar cane. 2.5 Methods of determining maturity of cane. 2.6 Pre harvesting maturity survey. 2.7 Factors affecting maturity of cane.	06	12
Course Outcome **SMF304-3-** Explain physical &chemical properties, molecular formula & biosynthesis of sucrose.			
3	SUGAR CHEMISTRY 3.1 Molecular & structure formula of sucrose, glucose, Fructose. 3.2 Physical & chemical properties of sucrose. 3.3 Solubility of sucrose. 3.4 Decomposition of sucrose. 3.5 Biosynthesis of sugar in sugar cane	06	10
	Total	24	40

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course Outcome **SMF304-4**-Draw & explain flow diagram of sugar manufacturing process.		
4	MANUFACTURING PROCESS OF SUGAR. 4.1 Definitions: Cane,Brix,Pol,Purity, Mixed Juice, Primary Juice, Last mill Juice, bagasse, Molasses, Fibre, normal weight, normal sugar solution. 4.2 Sugar manufacturing process (process flow chart) from sugar cane. 4.3 Input used in process.(Raw materials like lime Sulphur, phosphoric acid etc.) 4.4 Jaggery manufacturing process 4.5 Khandsari manufacturing process 4.6 Intermediate by products.	06	10
	Course Outcome **SMF304-5**-Know & recognize equipments used in sugar manufacturing process.		
5	PLANT EQUIPMENTS. 5.1 Function/purpose and specification of equipment used in sugar manufacturing process as per I-1 form. 5.2 Specification of feeder table, cane carrier, Juice heater, Evaporator &Pan. 5.3 Criteria for selection of factory site. 5.4 Layout plan of factory.	06	10
	Course Outcome **SMF304-6**- Analyze and Determine various parameters of juice, jiggery &molasses.		
6	METHOD OF ANALYSIS&CHEMICAL REACTION 6.1 Equipments in Sugar factory laboratory 6.2 Construction of Brix Hydrometer, Hand refractometer, Polarimeter, Nicol prism. 6.3 Procedure for determination of brix%, pol% & Purity of cane juice, Sugar, Jaggery & molasses. 6.4 Chemicals used in clarification process. 6.5 Role of pH, Temp.& Reaction time. 6.6 Reaction taking place during clarification.	12	20
	Total	**24**	**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.			

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	SUGAR INDUSTRY HISTORY & SUGAR CANE	04	10	04	SMF304-1	18
2	PLANTATION, HARVESTING & MATURITY	04	04	04	SMF304-2	12
3	SUGAR CHEMISTRY	04	06	00	SMF304-3	10
4	MANUFACTURING PROCESS	02	04	04	SMF304-4	10
5	PLANT EQUIPMENTS	02	04	04	SMF304-5	10
6	METHODS OF ANALYSIS & CHEMICAL REACTIONS	04	06	10	SMF304-6	20
TOTAL		20	34	26		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.

D) TERM WORK

Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as Term Work as detailed in the *Laboratory Manual for Applied Mechanics* developed by the Institute in practical sessions:

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
1	To study scenario of Indian cane sugar industry.	Understanding the present status of Indian Sugar Industry in the world	SME304-1
2	To determine the maturity of sugar cane by hand refractomrter.	Handling of hand refractometer & determination of maturity of cane	SME304-2
3	To study physical & chemical properties of Sucrose.	1. Understanding properties of sucrose. 2. Molecular formula. 3. Structural formula.	SME304-3
4	To study Sugar manufacturing process by visiting factory..	1. Understanding Manufacturing process. 2. Chronological order of Equipment. 3.Sectionwise list of equipments & their purpose &functions.	SME304-4
5	To determine a) Brix% Cane Juice. b) Brix% Sugar. c) Brix% Jaggery. d) Brix% Molasses.	Student will develop the skill of: 1) Handling and using the Hand refractrometer and Brix hydrometer. 2) Filling the cylinder, which should be perfectly vertical? 3) Taking the reading by keeping eyes in	SME304-5 SME304-6

	e) Pol% & Purity of Cane Juice. f) Pol% & Purity of Sugar. g) Pol% & Purity of Jaggery. h) Pol% & Purity of Molasses. i) Study hand refractometer. j)Study brix hydrometer.	line with the plane surface of liquid. 4) Noting the temperature of the liquid from the thermometer. 5) Reading the Brix and Temperature correction table 6) Handling and using the Polarimeter / Saccharimeter 7) Checking the zero point of the poloriscope. 8) Reading the scale and noting the polarization reading 9) Using the quartz plates of different range 10) Applying the scale correction based on quartz plate readings to be applied to all polarization reading 11) Reading the table indicating pol. percentage Using the pol tube of various sizes.	

E) INDUSTRIAL EXPOSURE :

SN	Mode of Exposure	Topic
1.	Introduction of various parts of equipments used in sugar manufacturing process & Laboratory analysis.	Every chapter of Theory & term work assignment

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

j) Assessment Criteria for Term 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 25
Cognitive	Understanding	08
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	02
Affective	Discipline and punctuality	02
	Accuracy	03
TOTAL		**25**

ii) Progressive Skill Test :

One mid-term *Progressive Skill Test* of 25 marks shall be conducted as per criteria
Final marks of term work shall be awarded as per *Assessment Pro-forma IV.*

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. Item Bank

REFERENCE MATERIAL:

a) Books / Journals / IS Codes

Sr. No.	Author	Title	Publisher
1.	D.P.Kulkarni	Cane Sugar Manufacturing In India	S.T.A.New Delhi
2.	Mangal Singh	Training Manual For Sugar Mill	Somaiya pub. Delhi
3.	R.B.L.Mathur	Handbook of Cane Sugar Technology	Oxford pub. New Delhi
4.	S.V.Karmarkar	Cane Sugar Processing Principles& practice	D.S.T.A.Pune
5.	Govt. of Bombay	Sugar Cane Cultivation In Bombay States	Directorate Gov. Bombay

b) Websites: *www.howstuffworks.com*

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COURSE ID:

Course Name : SUGAR FACTORY EQUIPMENTS
Course Code : SMF305
Course Abbreviation : FSFE

TEACHING AND EVALUATION SCHEME:

Pre-requisites: None.
Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	3	7
Practical	4	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		
	Theory	Practical	Theory	Practical	Term Work
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	One practical (2hours)*	T W
Marks	20 each	25	80	25	25

Assessment as per Pro-forma IV and VI.

Rationale:

There are various Mechanical and Chemical operations carried out in sugar industry, hence it is very essential to understand the constructional features, functional aspects and working of such equipment.

This course is basically dealt with the different equipments involved in Sugar Manufacturing process at various stations and the maintenance thereof. Studies of the major and most of the equipments involved in Sugar Manufacturing process are included in this course.

COMPETENCY: Develop skill in respect of construction and working of equipments.

Cognitive:. Understand the construction features, functional aspects &working of process equipments.
Psychomotor:. Draw varies diagrammatic representation of varies process equipments.
Affective: Attitude of i) precision ii) accuracy iii) Safety iv) Punctuality.

COURSE OUTCOMES:

SMF305-1.List out varies units involved in sugar manufacturing process.
SMF305-2 Explain the construction &testing of Juice heater &Sulphur burner.
SMF305-3 Explain the construction &working of vacuum filter &juice clarifier.
SMF305-4 Explain the construction &working of Evaporator.
SMF305-5 Explain the construction &working of Pan.
SMF305-6 Explain the construction &working of Centrifugal machine.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency Develop skill in respect of construction and working of equipments.	2	2	1	-	-	-	-	2	1	2	2	2
SMF305 -1	2	2	1	-	-	-	-	2	1	2	2	2
SMF305 -2	2	2	1	-	-	-	-	2	1	1	2	2
SMF305 -3	2	2	1	-	-	-	-	2	1	2	2	2
SMF305 -4	2	2	1	-	-	-	-	2	1	2	2	2
SMF305 -5	2	2	1	-	-	-	-	2	1	1	2	2
SMF305 -6	2	2	1	-	-	-	-	2	1	2	2	2

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
	Course Outcome SMF305-1.List out varies units involved in sugar manufacturing process.		
1	EQUIPMENTS 1.1 Section wise list of equipments involved in cane preparation. 1.2 List of equipments involved in boiling house. 1.3List of equipments involved in sugar separation, drying &grading in Sugar Manufacturing Process and their function/ purpose.	**04**	**06**
	Course Outcome SMF305-2 Explain the construction &testing of Juice heater &Sulphur burner.		
2	JUICE HEATER 2.1Working principle and construction of Water and Juice Weighing system. 2.2 Design aspects, Operation and Testing of juice heaters. 2.3 General Types of juice heaters. 2.4 Method of starting juice heaters. 2.5 Check points, Trouble shooting, Stopping of juice heater.	**06**	**12**
	LIME SLAKER AND SULFUR FURNACE 2.6 Working operation and construction of Lime Slaker. 2.7 Working Operation and construction of Sulfur Furnace 2.8 Air dryer, air compressor, air receiver,	**04**	**06**
	Course Outcome SMF305-3 Explain the construction &working of vacuum filter &juice clarifier.		
3	REACTION TANK AND FILTRATION UNIT 3.1 Arrangement of equipments in Juice Reaction Tank. 3.2 MAPCON System. 3.3 Construction and operation of Rotary Drum Vacuum Filter. 3.4 Testing of Rotary Drum Vacuum Filter,	**06**	**10**
	JUICE CLARIFIER 3.5 Working principle,Operation and Constructional aspect of clarifier, Flash Tank. 3.6 Types of Clarifier: Multi feed Dorr, Rapi Dorr & Rapi 444, Tray less Clarifier. 3.7 Testing of Clarifier,	**04**	**06**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	Course Outcome: SMF305-4 Explain the construction &working of Evaporator.		
4	EVAPORATOR 4.1 Construction and General arrangement of evaporator. 4.2 Entrainment catchers. 4.3 Working of evaporator, Operation, Starting and Stopping. Condensate removal and receivers. 4.4 Vacuum Equipment,	**05**	**10**
	Course Outcome: SMF305-5 Explain the construction &working of Pan.		
5	VACUUM PANS 5.1 Design specification of Pan. 5.2 Construction of batch pan, Calandria, Entrainment catcher design, Modified pan. 5.3 Continuous type pan. 5.4 Testing and trials of Batch Vacuum pan, Vacuum Trouble. 5.5 Testing and trials of Continuous Vacuum pan. 5.6 Method of starting, Commissioning of pan. 5.7 Precaution while operating pan, Liquidation of pan, Pan Accessories. 5.8 Spray Pond.	**07**	**12**
	Course Outcome: SMF305-6 Explain the construction &working of Centrifugal machine.		
6	CRYSTALLIZERS 6.1 Air cooled and Water cooled Crystallizer, Continuous Crystallizers. 6.2 Construction of Vertical crystallizer, Vacuum crystallizer. 6.3 Pug Mills, Transient Heater,	**04**	**06**
	CENTRFUGAL MACHINES 6.4 Constructional features and Operation of Batch & Continuous Type centrifugal machine. 6.5 Process Cycle and Sequence of Operation. 6.6 Check list Before Starting the machine. 6.7 Super Heated Wash System.	**04**	**06**
	CONVEYORS, GRADER AND STORAGE 6.8 Construction of Grass hopper, Elevator, Sugar Grader, Dust catcher, Molasses Tank, Molasses conditioning Tank,	**04**	**06**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Specification table for setting question paper for semester end theory Examination

Section / Topic no.	Name of Topic	CO	Distribution of marks (level wise)			Total Marks
			Reme-mber	Unders-tand	Applic-ation	
I / 1	EQUIPMENTS & MAINTENANCE	SMF305-1	02	02	04	**08**
I / 2	JUICE HEATERS	SMF305-2	02	04	04	**10**
	LIME SLAKER AND SULFUR FURNACE		02	04	--	**06**
I / 3	REACTION TANK AND FILTRATION UNIT	SMF305-3	02	02	04	**08**
	JUICE CLARIFIER		02	02	04	**08**
II / 4	EVAPORATOR	SMF305-4	02	04	04	**10**
II / 5	VACUUM PAN	SMF305-5	02	04	06	**12**
II / 6	CRYSTALLIZERS	SMF305-6	02	02	04	**08**
	CENTRFUGAL MACHINES	SMF305-6	02	02	02	**06**
	CONVEYOR, GRADER AND STORAGE	SMF305-6	--	02	02	**04**
			18	28	34	**80**

While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.

Laboratory experiences and related skills developed.

Sr. no	**Laboratory experience**	**CO**	**Skills developed**
1	To study following equipments from constructional and operational point of view by visiting nearby Sugar Plant.		To understand the process flow & the equipments involved in the process. To comprehend and distinguish the various parts of the equipments. To understand constructional features of the equipments. To understand functioning of the equipments. To observe and realize operations and working principle of above equipments.
	a) Juice weighing tank. b) Milk of Lime preparation Unit. c) Sulfur Furnace: Sulfur burner, Scrubber, Air- compressor. d) Juice heater, Passes, Double beat valves, condensate receiver.	SMF305-2	
	e) Juice and syrup sulphitation unit. f) Rotary Drum vacuum filter, g) Clarifier: Rapi Dorr, Dorr 444, Flash tank.	SMF305-3	
	h) Evaporator :Vapor cell, Falling Film and Rising Film evaporator.	SMF305-4	
	i) Pans, Low head pan, Continuous pan.	SMF305-5	

	j) Air cooled, Water cooled, Vacuum and Vertical Crystallizer. k) Centrifugal machine, Batch and Continuous type, drive for machines. l) Hopper and Grader, Blowers, Sugar Elevator.	SMF305-6	

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Prepareness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.
4. Factory Visits.
5.

Teaching and Learning Resources, including References of Books:

1. Chalk & Black-Board
2. O.H.P.
3. Slides
4. Video Films.
5. Books:
   1) Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
   2) Introduction to Cane Sugar Technology -By Jenkins.
   3) Handbook of Cane Sugar Technology -By Spencer & Meade.

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
		25

Assessment for Semester End Practical Exam as per Pro-forma V and VI.

COURSE ID:

Course Name : MECHANICAL & FLUID FLOW OPERATIONS

Course Code : SMF 306

Course Abbreviation : FMFO

TEACHING AND EVALUATION SCHEME:

Pre-requisites : None.

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

Evaluation Scheme:

Component	PROGRERSSIVE ASSESSMENT		SEMESTER END EXAM		TOTAL MARKS
	TH	TW	TH	OR	
Duration	Two Tests (1hour each)	One Practical (2 Hours)	One Paper (3 hours)	2 Hours	
Marks	20	25	80	25	150

* Assessment as per Pro-forma V & VI.

Rationale:

The profession of Sugar Manufacturing / Engineering has to deal with Industrial Processes where in raw material are changed into finished or separated into useful products. The Engineer is one who has skill in developing, designing, constructing and operating Process Plants. The subject gives the knowledge of major Unit Operations (Mechanical Operations) and fluid flow and fluid transportation machinery involved in Sugar Manufacturing and other related Chemical Processes. The knowledge gained by this subject is directly used in different subjects studied in Sugar and Chemical Engineering.

COMPETENCY:

Apply the knowledge of measure unit operation, fluid flow & fluid transportation machinery involved in sugar manufacturing.

Cognitive: 1) Understand various unit operations & unit processes.

2) Understand principle, working of fluid flow machinery.

Psychomotor: 1) Handling basic laboratory equipments.

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

COURSE OUTCOMES:

SMF306-1-Analyze the basic mechanical operations & unit operation size reduction.

SMF306-2-Analyze the unit operation mixing & sedimentation.

SMF306-3-Understand the different methods of separation of solids.

SMF306-4-Explain fundamental laws of classification, methods of transportation of fluids.

SMF306-5-Analyze the unit operation filtration.

SMF306-6- Explain types & properties of fluids.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency:- Apply the knowledge of measure unit operation, fluid flow & fluid transportation machinery involved in sugar manu.	2	3	2	-	-	-	-	2	2	2	2	2
SME 306 -1	2	3	2	-	-	-	-	2	1	2	2	2
SME 306-2	2	3	1	-	-	-	-	2	2	2	2	2
SME 306-3	2	3	2	-	-	-	-	3	2	2	3	2
SMF306-4	3	3	2	-	-	-	-	3	2	2	3	3
SMF306-5	2	3	2	-	-	-	-	3	2	2	3	3
SMF306-6	2	3	2	-	-	-	-	2	1	2	3	3

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Marks
Course Outcome SMF306-1-Analyze the basic mechanical operations & unit operation size reduction.			
1	INTRODUCTION TO MECHANICAL OPERATION 1.1 Various Unit Operations and Unit processes, Units and dimensions, System of units, Force, Volume, Pressure, Work / energy, Power, Heat. 1.2 Basic laws: Ideal Gas Law, Daltan's Law, Newton's 2nd Law of motion. 1.3 Dimensional formulae and equations, dimensional analysis, Dimensionless group, useful mathematical Methods.	**04**	**08**
	SIZE REDUCTION 1.4 Necessity of Size reduction, Energy and Power for Size reduction. 1.5Basic laws: Rittinger's Law, Kick's Law, Bond's Law and work index. 1.6 Types of size reduction equipments. 1.7 Principle involved in crushing and grinding. 1.8 construction of Crushing Rolls, Ball Mills. 1.9 Factors affecting the size of the product in ball mill. 1.10 Comparison of crushing & grinding, Jaw Crusher & Gyratory crusher.	**06**	**08**
Course Outcome SMF306-2-Analyze the unit operation mixing & sedimentation.			
2	MIXING 2.1 Principle involved in mixing, Types of mixing. 2.2 Typical agitated Vessel, study of flow pattern in agitated Vessel. 2.3 Role of Turbines, impellers, Propellers in mixing, Baffled tank and un baffled tanks. 2.4 Prevention of swirling and vortex formation.	**04**	**08**
	SEDIMENTATION 2.5 Principle involved in Sedimentation. 2.6 Laboratory Batch Sedimentation Test. 2.7 The Thickener, Setting zones in continuous Thickener.	**06**	**10**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Marks
Course Outcome SMF306-3-Understand the different methods of separation of solids.			
3	SEPARATION OF SOLIDS FROM SOLIDS 3.1 Diffusion and mechanical separations, Screening. 3.2 Types of screening. 3.3 Study of Principle, working and construction of vibrating screen, Variable in screening operation. 3.4 Material Balance over screen. 3.5 Capacity and Effectiveness of screen. 3.6 factors affecting Effectiveness of screen, Comparison of Ideal & Actual Screen. 3.7 Grizzlies & Trommels, Application in sugar industry.	**04**	**06**
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	Teaching (Hours)	Theory evaluation Marks
Course Outcome SMF306-4-Explain fundamental laws of classification, methods of transportation fluids.			
4	**CLASSIFICATION** 4.1 Introduction, Fundamental Laws of Classification. 4.2 Gravity Setting Tank. 4.3 Principal of operation, Construction, Working and Application of Following: Dorr Classifier, Hydraulic Jig, Froth Flotation.	**04**	**06**
	TRANSPORTATION OF FLUID 4.4 Methods of Transportation of fluids. 4.5 Construction of Centrifugal pump and Single Acting Reciprocating Pump. 4.6 Comparison of Centrifugal pump and Reciprocating Pump. 4.7Merits and Demerits of Centrifugal pump and Reciprocating Pump.	**04**	**08**
Course Outcome SMF306-5-Analyze the unit operation filtration.			
5	**FILTRATION** 5.1 Principle of filtration. 5.2 Factors affecting rate of filtration, 5.3 Types of filtration, Filter Medium (characteristics), Filter aids, Pressure Filter and Vacuum Filter, Study of Principle. 5.4 Working and construction of Filtration Equipments (plate & frame, Rotary drum vacuum filter, Centrifugal Filtration), Advantages, disadvantages and applications. 5.5 Rapid Sand Filter, Pressure Sand Filter, Coagulants and Role of Coagulants in filtration.	**06**	**10**

Course Outcome SMF306-6- Explain types & properties of fluids.			
6	FLUIDS 6.1 Types of fluids: Ideal and Actual fluids. 6.2 Newtonian and Non- Newtonian fluids. 6.3 Time dependents and Independent fluids, In-compressible and compressible fluids. 6.4 Properties of fluids: Density, Viscosity, Specific Gravity, Viscosity, Vapor pressure, Surface Tension, Pressure Head concept. 6.5 Principle of Hydrostatic equilibrium, In-compressible and compressible fluids.	**04**	**06**
	FLOW OF FLUIDS 6.6 Steady and unsteady flow, Laminar and Turbulent flow, Potential Flow, Fully Developed Flow. 6.7 Bernoulli's equation, Pressure energy, Kinetic Energy, Potential Energy, Potential Head, Kinetic Energy Correction, Correction for fluid friction, Pump Work in Bernoulli Equation, Reynolds' Experiment. Calculation of mass flow rate, Volumetric flow rate, Average velocity & Mass Velocity, Reynolds' number, important application of Bernoulli's Equation.	**06**	**10**
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	CO	Distribution of marks (level wise)			Total Marks
			Remember	Under-stand	Application	
I / 1	INTRODUCTION TO MECHANICAL OPERATION	SMF306-1	04	04	-	**08**
	SIZE REDUCTION		02	02	04	**08**
I / 2	MIXING	SMF306-2	02	02	04	**08**
	SEDIMENTATION		00	02	04	**06**
I / 3	SEPARATION OF SOLIDS FROM SOLIDS	SMF306-3	02	04	04	**10**
			10	14	16	**40**
II / 4	CLASSIFICATION	SMF306-4	02	02	02	**06**
	TRANSPORTION OF FLUIDS		00	04	04	**08**
II / 5	FILTRATION	SMF306-5	02	04	04	**10**
II / 6	FLUIDS	SMF306-6	02	02	02	**06**
	FLOW OF FLUIDS		02	04	04	**10**
			08	16	16	**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.						

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience		Skills developed
1.	Study of Ball Mill used in Sugar Industry. (To be conducted in Sugar Industry)	SMF306-1	Handling & preparation of sugar slurry
2.	Study of Magma Mixer.(To be conducted in Sugar Industry)	SMF306-2	Making magma
3.	Study of vibrating screen used in sugar Industry.(To be conducted in Sugar Industry)	SMF306-3	Separation of fine sugar with proper grade.
4.	Study of Laboratory Batch Sedimentation Test	SMF306-2	Operating skills.
5.	Study of Dorr Classifier used in Sugar Industry .(To be conducted in Sugar Industry)	SMF306-4	Separation of mud & clear juice
6.	Study of construction of Rotary Drum Vacuum Filter filtration under vacuum. (To be conducted in Sugar Industry)	SMF306-5	Muddy juice separation & reduce loss in filter cake
7.	Study of Reynolds's experiment.	SMF306-6	To understand concept of Laminar and turbulent flow.
8.	Study Centrifugal pump and its Components.(To be conducted in Sugar Industry)	SMF306-6	Construction & working of centrifugal pump.
9.	Study Single acting reciprocating pump and its Components.(To be conducted in Sugar Industry)	SMF306-6	To observe and understand working principle of various pumps.

Criteria for Continuous Assessment of Practical Work/ TW and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.
4. Study of equipments during Factory Visits.

Teaching and Learning Resources, including References of Books:

1) Chalk & Black-Board
2) O.H.P.
3) Slides
4) Video Films.
5) Books:
    1) Introduction to Chemical Engineering -- By Badger and Boucher.
    2) Unit Operation of Chemical Engineering -- By Maccabe and Smith.
    3) Unit Operation. -- By Gavane / Muzumdar / Ali.
6) Web site: www.howstuffworks.com

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
	Total	25

Assessment of PR / TW at the end of Semester will be as per Pro-forma V & VI

COURSE ID:

Course Name : MASS AND HEAT TRANSFER OPERATIONS
Course Code : SMF 307
Course Abbreviation : FMHT

TEACHING AND EVALUATION SCHEME:
Pre-requisites: NIL
Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL	T W	
Marks	20 each	--	80	25	25	150

* Assessment as per Pro-forma V and VI.

Rationale:

The profession of Engineering has to do with Industrial Processes where in raw material are changed or separated into useful products. In order to acquire skill of developing designing, constructing the equipments used in Industrial Process Plants, knowledge of Heat Transfer and Mass Transfer is essential. At the same time understanding of corresponding significant factors affecting the processes is crucial. This course is dealt with the Chemical Engineering oriented operations and troubles involved in Sugar Production.

COMPETENCY:

Applying the knowledge of Heat transfer & Mass transfer to sugar manufacturing process as follows:

Cognitive: Understand and applying principle heat and mass transfer to engineering problems.

Psychomotor: i) Calculating skills ii) operating skills iii) Designing skills

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

COURSE OUTCOMES:

SMF307-1 Understanding the concept of various modes of heat transfer.
SMF307-2 Differentiate free and forced convection & understand concept of radiation.
SMF307-3 Comprehend principle of evaporation.
SMF307-4 Analyze the concept of distillation.
SMF307-5 Analyze the concept of absorption & extraction.
SMF307-6 Explain the mass transfer operation through crystallization & drying.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying the knowledge of Heat transfer & Mass transfer to sugar manufacturing process	2	2	1	-	-	-	-	2	2	2	1	1
SMF307-1	2	2	1	-	-	-	-	2	1	2	1	1
SMF307-2.	2	1	-	-	-	-	-	-	1	2	1	1
SMF307-3.	2	2	1	-	-	-	-	-	1	2	1	2
SMF307-4	1	2	2	-	-	-	-	-	1	1	1	1
SMF307-5	1	2	2	-	-	-	-	-	1	1	1	1
SMF307-6	2	2	1	-	-	-	-	-	1	2	1	1

SECTION I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcome SMF307-1 Understanding the concept of various modes of heat transfer.			
1	CONDUCTION 1.1 Heat, Various modes of Heat Transfer. 1.2 H T by Conduction, Fourier's law, Thermal conductivity. 1.3 Heat flow through plane wall and cylinders. 1.4 Compound resistance in series (Simple numerical on H T by conduction through plane wall and Cylinder	**04**	**10**
Course Outcome SMF307-2 Differentiate free and forced convection & understand concept of radiation.			
2	CONVECTION 2.1 Forced and Free convection , Individual and overall heat transfer Coefficient. 2.2 Temperature gradient in forced convection. 2.3 Counter current and Co-current flow, Energy balances. 2.4 Application of Log Mean Temperature Difference. 2.5 Drop wise and Film wise condensation. 2.6 Heat Transfer in condensation of vapors. 2.7 Heat Transfer to boiling liquids, effect of non condensable gases, (Simple numerical on rate of Heat Transfer / Heat Loss in convection)	**08**	**12**
	RADIATION 2.8 Heat Transfer by Radiation. 2.9 Absorption, Reflection & Transmission in a substance. 2.10 Kirchhoff's Law. 2.11 Boltzmann's Law. 2.12 Effect of temperature on radiation. (No numerical)	**02**	**04**

Course Outcome SMF307-3 Comprehend principle of evaporation.			
3	EVAPORATION 3.1 Principles of evaporation by steam. 3.2 Single and multiple effect evaporation. 3.3 Performance of evaporator, Capacity, Economy, Steam Consumption. 3.4 Boiling point elevation. 3.5 Material and enthalpy balances in evaporation. 3.6 Relationship between Temperature, Pressure and Latent Heat in multiple effect evaporators. 3.7 Optimum numbers of effect and Methods of feeding in multiple effect evaporator system. 3.8 Factors affecting selection, heat transfer and capacity of Evaporator. 3.9 Types of evaporator (Horizontal tube, Calandria/ standard vertical tube, Long tube vertical Evaporator)	**10**	**14**
		24	**40**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course Outcome SMF307-4 Analyze the concept of distillation.			
4	DISTILATION 4.1 Boiling point, Equilibrium, Driving force, Equilibrium Stage. 4.2 Vapor-Liquid Equilibrium (Boiling point diagram). 4.3 Raoult's and Dalton's Law, Relative Volatility. 4.4 Methods of distillation (Binary System): Differential or Simple distillation, Flash or Equilibrium distillation, Continuous Rectification, Fractionating column, Stripping & Rectifying Section. 4.5 Rectification on ideal plate, Material balance on Ideal plate of Fractionating column, Analysis of Fractionating column. 4.6 Step wise procedure for obtaining theoretical plates, Limitations of McCabe Thiele Method, Feed plate and Feed line (only diagram of flow through feed plate for various feed conditions and effect of feed condition on feed line). 4.7 Optimum Reflux ratio for distillation, Batch Distillation, Azeotropes Mixture. 4.8 Plate Columns:(Bubble cap tray/plate, Sieve plate), Liquid flow patterns over tray, Packed column for distillation.	**10**	**14**
Course Outcome SMF307-5 Analyze the concept of absorption & extraction.			
5	**GAS ABSORPTION** 5.1 Equilibrium, Molecular Diffusion. 5.2 Selection criteria for solvent in gas absorption. 5.3 Gas absorption equipments: Mechanically agitated vessel, Packed Column/tower, Plate Column (valve plate). 5.4 Characteristics & Types of Tower Packing. 5.5 Relative merits of plate and packed towers.	**03**	**05**
	LIQUID – LIQUID EXTRACTION 5.6 Liquid-liquid extraction process, Ternary system. 5.7 Selection of solvent of Extraction. 5.8 Extraction Equipments: Perforated plate/Sieve Tray Tower, Spray Tower, Packed Tower, Rotating Disc Contactor.	**03**	**05**

Course Outcome SMF307-6 Explain the mass transfer operation through crystallization & drying.			
6	**CRYSTALISATION** 6.1 Principles of Crystallization, Crystal. 6.2 Solubility and solubility curves. 6.3 Crystal formation, Meir's super saturation theory. 6.4 Yield of crystallization process, Cracking of crystal. 6.5 Methods of super saturation. 6.6 Crystallizers: Agitated tank crystallizer, Walker crystallizer, Vacuum Crystallizer, Material balance of crystallizer.	**04**	**08**
	DRYING 6.7 General Definitions(Moisture content on wet & dry basis, Equilibrium moisture content, Bound & Unbound moisture content, Free moisture content, Critical moisture content, Relative humidity, Humidity, Dry bulb temperature, Wet bulb temperature, Saturation Humidity. 6.8 Constant rate period & Falling rate period. 6.9 Percentage humidity, Dew point , Equilibrium moisture curve. 6.10 Rate of drying curve, Factors affecting rate of drying, 6.11 Types of dryers: Direct dryers(Tunnel dryer), Indirect Dryers(Drum dryer), Continuous Dryers(Fluidized bed dryer), Batch Dryer(Tray Dryers). 6.12 Instrumentation Diagram for Dryer.	**04**	**08**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of Topic	CO	Distribution of Marks (Level wise)			Total Marks
			Remember	Understand	Application	
I / 1	CONDUCTION	SME307-1	02	04	04	10
I / 2	CONVECTION	SME307-2	02	04	06	12
	RADIATION		02	02	--	04
I / 3	EVAPORATION	SME307-3	05	04	05	14
II / 4	DISTILLATION	SME307-4	04	06	04	14
II / 5	GAS ABSORPTION	SME307-5	02	03	--	05
	LIQUID-LIQUID EXTRACTION		02	03	--	05
II / 6	CRYSTALIATION	SME307-6	02	02	04	08
	DRYING		02	02	04	08
			23	30	27	80

Laboratory Experiences.

Sr. No	Laboratory experience	CO	
1	To study overall film heat transfer coefficients for heat exchangers used in sugar industry: Shell and tube exchanger.	SMF307-2	1)Understand the concept of various modes of Heat Transfer such as 2)Conduction, Convection Radiation etc 3)Differentiate free and forced convection. 4)Comprehend principle of evaporation(Single & Multiple Effect) 5)Understand the concept of capacity and economy in Multiple Effect evaporation 6)Know the principle of Film wise and Drop wise condensation. 7)Understand the concept of various Mass Transfer Operations such as distillation, extraction, crystallization, drying, absorption etc. 8)Get slightly friendly with the constructional aspects, working and operational principles ofEquipments involved in Heat & Mass Transfer Operation.
2	To study overall heat transfer coefficient of a single effect Evaporator & quadruple effect evaporator in sugar Industry.	SMF307-2	
3	To Study steam economy and capacity of Evaporator and multiple effect evaporator in sugar industry.	SMF307-3	
4	To study method of separating a binary mixture by a simple or differential distillation	SMF307-4	
5	To study method of separating the components of a liquid mix. By fractional distillation.	SMF307-4	
6	To study the effect of constant reflux on a batch distillation unit.	SMF307-4	
7	To study the bubble cap distillation column	SMF307-4	
8	To draw the Number of plates in distillation column By McCabe Thiele Method	SMF307-4	
9	To Study various drying equipments used in sugar industry.	SMF307-6	
10	To study the equipments used for crystallization in Sugar Industry.	SMF307-6	
11	To study of Long Tube Evaporator used in Sugar Industry.	SMF307-4	

Note : (Collect the required data by visiting the Live Sugar Plant).

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1) Lectures and discussions.
2) Laboratory experiences and laboratory interactive sessions.
3) Time bound assignments.
4) Factory Visits.

Teaching and Learning Resources, including References of Books:

1) Chalk & Black-Board
2) O.H.P.
3) Slides
4) Video Films.
5) Books:

1. Introduction to Chemical Engineering -- By Badger & Boucher.
2. Unit operation of Chemical Engineering -- By Mac Cabe and Smith.
3. Unit Operation-II ---- By Gavane / Muzumdar / Ali.

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
	Total	25

Assessment for Semester End Practical Exam as per Pro-forma II.

COURSE ID:

Course Name : CHEMICAL PROCESS TECHNOLOGY
Course Code : SMF 308
Course Abbreviation : FCPT

TEACHING AND EVALUATION SCHEME:

Pre-requisites: None.

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		Total
	Theory	Term Work	Theory	Oral	
Duration	Two tests (1hour each)	Skill Test / Practical (2 Hours)	One paper (3 hours)	Oral	
Marks	20 each	25	80	25	150

Assessment as per Pro-forma V and VI

Rationale:

As being allied branch of Chemical Engineering, the students of Sugar Manufacturing Program should know the Chemical Process Technology. Especially in this course student will study the reaction kinetics, technology and process involved in the commercial manufacture of various chemicals used in manufacture of Sugar.

COMPETENCY:

Applying the knowledge of Chemical process technology in sugar manufacturing process & allied industry as follows:

Cognitive: Understand and applying principle, process of various products & allied industry.
Psychomotor: i) Draw various flow charts of process ii) Operating skills
Affective: Attitude of i) Precision ii) Accuracy iii) Safety iv) Punctuality v) Aesthetic presentation.

COURSE OUTCOMES:

SMF308-1 Understanding different types & classification of chemical process.

SMF308-2 Classify unit operation & unit operation.

SMF308-3 Draw process flow chart of sulphuric acid, Ammonia etc.

SMF308-4 Understand & draw process flow chart of alcohol based products.

SMF308-5 Understand & draw process flow chart of fertilizers.

SMF308-6 Understand & draw process flow chart of pulp, paper, fuel & industrial gases.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying the knowledge of Chemical process technology in sugar manu. process & allied industry	2	2	-	-	-	-	-	2	2	2	2	2
SMF308-1 Understanding different types & classification of chemical process	1	1	1	-	-	-	-	1	1	1	1	1
SMF308-2 Classify unit operation & unit operation.	2	2	-	-	-	-	-	1	-	1	2	2
SMF308-3 Draw process flow chart of sulphuric acid, Ammonia etc	2	2	-	-	-	-	-	2	2	2	2	2
SMF308-4 Understand & draw process flow chart of alcohol based products	2	2	1	-	-	-	-	2	2	2	2	2
SMF308-5 Understand & draw process flow chart of fertilizers	1	2	1	-	-	-	-	2	1	1	2	2
SMF308-6 Understand & draw process flow chart of pulp, paper, fuel & industrial gases.	2	2	1	-	-	-	-	2	2	1	2	2

SECTION I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcome SMF308-1 Understanding different types & classification of chemical process.			
1	**INTRODUCTION** 1.1 Material for chemical processes. Basic principles of raw material beneficiation, Yield, Conversion and Efficiency. 1.2 Basic Types of Chemical Processing, Classification of Chemical Processes, Fuel and Power, Process and Mechanical Design, Economics.	02	04
Course Outcome SMF308-2 Classify unit operation & unit operation.			
2	**UNIT OPERATIONS AND UNIT PROCESSES** 2.1 Unit operation, Symbol and Uses of: Screening, Size Reduction. Fluid –Solid Separation, Distillation, Evaporation, Stripping, Fluid Storage, Drying, Heat Exchangers etc. 2.2 Unit Processes of Combustion, Fermentation, Hydration, Hydrolysis, and Oxidation etc. 2.3 Chemical Equilibrium: Exothermic and Endothermic reaction, homogeneous and heterogeneous Reaction, Irreversible and reversible reaction, 2.4 Important aspects of equilibrium reaction,	03	10
Course Outcome SMF308-3 Draw process flow chart of sulphuric acid, Ammonia etc.			
3	**PROCESSES AND TECHNOLOGY FOR COMMERCIAL MANUFACTURE OF THE FOLLOWING CHEMICALS** **3.1 Sulfuric Acid**: Chemical Name, Properties, Method of production, Raw material , Reaction, , flow diagram, Process description (Contact process), and Applications **3.2 Ammonia**: Chemical Name, Properties, Method of production, Raw material , Reaction, , flow diagram, Process description (Bosch-Haber process), and Applications. **3.3 Washing Soda**: Chemical Name, Properties, Method of production, Raw material, Reaction, , flow diagram, Process description (Solvay's ammonia Soda Process), Applications **3.4 Caustic soda and Chlorine**: Principle, raw material, Flow Sheet, Unit Operations, Properties and uses. **3.5 Hydrochloric Acid**: Chemical Name, Properties, Method of production, Raw material , Reaction, , flow diagram, Process description (Sulphate Method and Synthesis process) and Applications	02 02 02 03 02	05 05 05 06 05
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	Teaching (Hours)	Theory evaluation Marks
Course Outcome SMF308-4 Understand & draw process flow chart of alcohol based products.			
4	**ALCOHOL AND ALCOHOL BASED PRODUCTS** 4.1 Manufacture of ethyl alcohol by fermentation method. 4.2 Alcohol from molasses, from corn, from wheat, from sulphite liquor, denatured alcohol. 4.3 production of vinegar and ethyl acetate, properties and uses.	**03**	**10**
Course Outcome SMF308-5 Understand & draw process flow chart of fertilizers.			
5	**MANUFACTURE OF FERTILIZERS** 5.1 Plant Nutrient Elements, Raw material for various Fertilizers. 5.2 Manufacture of Urea. 5.3 Mixed Fertilizer: Ammonium Sulphate, Ammonium Nitrate, NPK, Phosphatic Fertilizers: Super phosphate, Triple Super phosphate, 5.4 Manufacture of Phosphorous and Phosphoric Acid, Wet Process and Electric furnace process.	**06**	**12**
Course Outcome SMF308-6 Understand & draw process flow chart of pulp, paper, fuel & industrial gases.			
6	**PAPER AND PULP TECHNOLOGY** 6.1 Raw material, manufacture and process discription (sulphite and sulphate). 6.2 flow sheet, manufacture of paper from pulp.	**03**	**08**
	FUEL AND INDUSTRIAL GASES. 6.3 Manufacturing process of Oxygen and Nitrogen. 6.4 Manufacturing process of Hydrogen. 6.5 Manufacturing process of Water Gas and Producer Gas. 6.6 Manufacturing process of Carbon di oxide.	**04**	**10**
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	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	INTRODUCTION	SMF308-1	02	02	-	**04**
I / 2	UNIT OPERATION AND PROCESSES	SMF308-2	02	02	06	**10**
I / 3	PROCESSES AND TECHNOLOGY	SMF308-3	08	08	10	**26**
II / 4	ALCOHOL AND ALCOHOL BASED PRODUCTS	SMF308-4	02	04	04	**10**
II / 5	MANUFACTURE OF FERTILIZERS.	SMF308-5	04	04	04	**12**
II / 6	PAPER AND PULP TECH	SMF308-6	02	04	02	**08**
	FUEL AND INDUSTRIAL GASES	SMF308-6	04	04	02	**10**
			24	28	28	**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.						

Laboratory experiences and related skills developed.

Sr no	Laboratory experience	CO	Skills developed
	To study the PROCESSES AND TECHNOLOGY USED FOR COMMERCIAL MANUFACTURE OF THE FOLLOWING CHEMICALS:(With respect to Chemical Name, Properties, Method of production, Raw material , Reaction, , Flow diagram, and Applications, Analysis and test of the following Chemical) 1) Commercial Sulfuric Acid. 2) Commercial Hydrochloric Acid. 3) Caustic Soda. 4) Commercial Soda Ash. 5) Chlorine 6) Phosphoric Acid 7) Ammonium Sulfate. 8) Urea. 9) Mixed fertilizers 10) Molasses Assignments on: • Laboratory chlorination and handling of Chlorine cylinder. • Prepared a report on Various Unit operation Carried out in Industry by visiting to nearby Plant : Oxygen Production unit, Fertilizer, Distillery, Sugar Industry etc.(Any One)	SMF308-3 SMF308-3 SMF308-3 SMF308-3 SMF308-3 SMF308-3 SMF308-3 SMF308-5 SMF308-5	Knowledge and ability of distinguishing various processes & Technology used for manufacturing different chemicals on commercial basis. Ability to draw Flow diagram of Processes. Knowledge and ability of precautionary measures to be taken while handling various chemicals Identifying & comparing various unit operations involved in Chemical and Allied Industry.

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1) Lectures and discussions.
2) Laboratory experiences and laboratory interactive sessions.
3) Time bound assignments.
4) Factory Visits.

Teaching and Learning Resources, including References of Books:

1) Chalk & Black-Board
2) O.H.P.
3) Slides
4) Video Films.
5) Books:
    1) Chemical Process Technology -By A P Kulkarni
    2) Introduction to
    3) Handbook of

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
		25

COURSE ID:

Course Name : BASIC ELECTRICAL ENGINEERING
Course Code : SMF309
Course Abbreviation : FBEE

TEACHING AND EVALUATION SCHEME:

Pre-requisites : NIL

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

Evaluation Scheme:

Component	Progressive Assessment		Semester end	
	Theory	TW/PR	Theory	Oral
Duration	Two tests (1hour each)	Skill Test / Practical (2 Hours)	One paper (3 hours)	Oral
Marks	20 each	25	80	25

*Assessment as per Pro-forma-V and VI

Rationale:

The basics of Electrical engineering are in the study of simple preliminary circuits provided with D.C supplies. All Electrical Engineering applications are based on the behaviour of the three basic parameters viz. resistance, inductance and capacitance when provided with different types of energy inputs (e.g. Direct current and alternating current). The response of these parameters to direct current/voltage input is simplest and thus helps us to get introduced to the fundamentals of Electrical Engineering.

The electro-magnetic devices work on the principle of magnetism and electromagnetism. All electrical machines can be studied and understood only if these principles are well understood with a little bit of sound mathematical base.

This course aims to empower mechanical engineering students with basic knowledge of electricity and its field applications related to industries.

COMPETENCY :

Apply electrical technologies for various applications in sugar manufacturing industry.

Cognitive : i) Understanding and applying the rules / laws in electrical engineering. ii)Observing iii) Classifying iv) Interpreting

Psychomotor : Handling of instruments, electrical machines, electrical devices/apparatus and tools

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

COURSE OUTCOMES :

SMF309.1. Apply the basic laws to simple electrical networks.

SMF309.2. Use relevant measuring instruments in AC networks.

SMF309.3. Work on three phase industrial supply systems.

SMF309.4. Use the single phase transformers in relevant applications.

SMF309.5. Use different machines/equipment/devices that work on electricity in industries.

SMF309.6. Use AC and DC motors in relevant situations of machine systems.

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan & Organize	PSO2 Production & Management
COMPETENCY	1	-	2	2	1	1	-	1	1	2	2	2
SMF309.1. Apply the basic laws to simple electrical networks.	1	-	2	2	1	1	-	1	-	2	1	1
SMF309.2. Use relevant measuring instruments in AC networks.	1	-	2	2	1	1	-	1	1	2	1	1
SMF309.3. Work on three phase industrial supply systems.	1	-	2	2	1	1	-	3	2	2	2	1
SMF309.4. Use the single phase transformers in relevant applications.	1	1	2	2	1	1	-	2	2	2	2	1
SMF309.5. Use different machines/equipment/devices that work on electricity in industries.	1	2	3	2	1	1	-	3	2	2	1	1
SMF309.6. Use AC and DC motors in relevant situations of machine systems.	1	3	3	2	1	1	-	3	2	2	1	2

SECTION - I

Sr. No.	Topics	Teaching (Hours)	Theory evaluation Marks
SMF309.1. Apply the basic laws to simple electrical networks.			
1.	**Introduction to elements of electric networks** 1.1. Ohm's law and Definition of Electric networks 1.2. Definitions of Resistance, Inductance, and capacitance. 1.3 Equivalent resistance of series, parallel and combination resistance systems. 1.4 Kirchoff's laws 1.5 Work, power and energy 1 6 Simple numerical problems based on the above.	**07**	**12**
SMF309.2. Use relevant measuring instruments in AC networks.			
2.	**Alternating Current Circuits:** 2.1 Concept of sinusoidal waveform. 2.2 Definition of cycle, frequency and periodic time. 2.3 Instantaneous value, average value, R.M.S & peak value 2.4 Purely Resistive A.C. Circuit. 2.5 Purely Inductive A.C. Circuit. 2.6 Purely Capacitive A.C. Circuit. 2.7 Definition of reactance, impedance and their units. 2.8 R-L, R-C and R-L-C series circuit and their Phasor representations.	**10**	**16**
SMF309.3. Work on three phase industrial supply systems.			
3.	**Three Phase Alternating Current Circuits:** 3.1 Polyphase System 3.2 Generation of Three-Phase Voltages. 3.3 Three-Phase Supply Systems. 3.3 Three-Phase Three-Wire System. 3.5 Three-Phase Four-Wire System. 3.6 Balanced Load. 3.7 Voltage, Current and Power relation in STAR connection. 3.8 Voltage, Current and Power Relation in DELTA connection.	**07**	**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	Teaching (Hours)	Theory evaluation Marks
SMF309.4. Use AC and DC motors in relevant situations of machine systems.			
4.	**ELECTRICAL MOTORS:** **D.C. MOTORS** 4.1 Classifications, Characteristics (Only torque-speed) 4.2 Schematic representation and their applications. 4.3 Necessity of starter, 4.4 Study of three-point starter. 4.4 Reversal of rotation of a D.C..motor	**05**	**08**
5.	**A.C. MOTORS** 5.6 Classification and characteristics of single-phase and Three-phase motors (Only torque-speed). 5.7 Their schematic representation and their applications. 5.8 Study of different types of starters used for three-phase Squirrel cage and slip-ring induction motors. 5.9 Reversal of rotation 5.10 Industrial applications.	**05**	**08**
SMF309.5. Use different machines/equipment/devices that work on electricity in industries.			
6.	**SINGLE PHASE TRANSFORMER:** 6.1 Principle of working 6.2 Constructional features 6.3 E.M.F. equation statement 6.4 Voltage and current ratios of Ideal transformer. 6.5 Practical transformer 6.6 Losses and efficiency 6.7 Approximate voltage drop and regulation by Direct loading.	**06**	**12**
7.	**ELECTRIC HEATING (ONLY DESCRIPTION AND DIAGRAM):** 7.1 Resistance Heating (Ovens). 7.2 Induction Heating Principle and Induction Heating Furnaces. 7.3 Block Diagram/ Schematic Diagram and working of induction Furnace. 7.4 Dielectric heating principles. 7.5 Block Diagram/ Schematic Diagram of dielectric heating Unit. 7.6 application of above heating system.	**08**	**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.			

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

Section / Topic no.	Name of topic	Distribution of marks (level wise)			CO	Total marks
		Remember	Understand	Apply		
I / 1	**Introduction to elements of electric networks**	4	4	4	SMF309-1	12
I/2	**Alternating Current Circuits**	4	6	6	SMF309-2	16
I / 3	Three Phase Alternating Current Circuits	4	4	4	SMF309-3	12
II / 4	Electrical Motors	4	4	8	SMF309-4	16
II/5	**Single phase transformers and** Electric Heating	4	8	12	SMF309-5	24

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.

Laboratory experiences and related skills developed:

Sr. no	Laboratory experience	Skills developed	CO
1	To observe the effect of temperature on resistance	a) Connect the various components as per the circuit diagrams (after reading them) using proper size wires b) Write the relation for temperature and the resistance. c) Plot the graphical relation between temperature and resistance of conductors	SMF309.1
2	To determine resistance and inductance of a choke coil.	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires 2) Find p.f. of inductive circuit, Impedance, Inductive reactance & Inductance	SMF309.1
3	To study effect of variation of current and power factor on L-R-C series circuit	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires 2) Draw vector diagram, find the p.f., 3) Calculate active power in the circuit..	SMF309.1
4	To Connect D.C. shunt motor starter.	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires. 2) Read the circuit diagram to connect the 3-point starter	SMF309.4
5	To Study Reversal of rotation of a D.C..motor.	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires. 2) Connect Various combinations of field and armature system connections	SMF309.4

6	To Connect A.C. starters to an induction motor	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires. 2) Read the circuit diagram to connect the various starters used for A.C. Machines	SMF309.4
7	Voltage and current ratio tests on a single phase transformer	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires. 2) Measure voltages, currents using voltmeters, ammeters; resistances using multi-meters and note their values in an orderly manner. 3) Determine the voltage and current ratio	SMF309.5
8	Determination of regulation and efficiency of a single-phase transformer.	1) Connect the various components as per the circuit diagrams (after reading them) using proper size wires. 2) Measure voltages, currents using voltmeters, ammeters; resistances using multi-meters and note their values in an orderly manner. 3) Calculate regulation and efficiency of a single-phase Transformer.	SMF309.5
9	Industrial Visit	1)Study of induction furnace	SMF309.5

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

Sr. No.	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	10
4	Observation tables	10
5	Result table / calculations / graphs	10
6	Safety / use of proper tools	5
		50

Instructional strategies:

1) Lectures and discussions.
2) Laboratory experiences and laboratory interactive sessions.
3) Time bound assignments.

Teaching and Learning resources, including references:

a) Chalkboard.
b) Demonstrative kits.
c) Demonstrative charts.
d) Books:

a) Electrical Technology (by Edward Hughes).
b) Electrical Technology (by H. Cotton).
c) Basic Electrical Engineering (by V. N. Mittal)
d) Electrical technology (by B. L. Theraja).
e) Fundamentals of Electrical Engineering (V. K. Mehta).
f) Utilization of electrical energy (Openshaw Taylor)

COURSE ID :

Course Name : APPLIED MATHEMATICS

Course Code : SMF310

Course Abbreviation : FAMT

TEACHING AND EVALUATION SCHEME :

Pre-requisite Course(s) : CCF105, CCF106
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.

Cognitive: understanding and applying principles of mathematics to engineering problems
Psychomotor: To prepare charts displaying the area of irregular shapes using the concept of integration, prepare charts to displaying grouped and ungrouped data
Attitude: discipline, consistency, hard work , to concentrate ,accuracy, punctuality, aesthetics

Course Outcomes (CO's):

SMF310.1 Apply the concept of integration to find the area ,Mean value and Root Mean Square values
SMF310.2 Solve Differential equation of first order and first degree by various methods
SMF310.3 Calculate Mean Deviation and apply the concept of Coefficient of Variance (C.V.) to compare two sets of data
SMF310.4 Solve problems on Probability using addition theorem

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance
Competency:	3	2	3	2	-	-	1	2	1	3	2	1
SMF310.1	3	2	2	-	-	-	1	1	1	3	2	1
SMF310.2	3	2	3	-	-	-	1	1	1	3	1	1
SMF310.3	3	2	3	1	2	-	1	2	3	3	2	1
SMF310.4	3	2	2	1	2	-	1	2	2	3	2	1

CONTENT :
1)THEORY :

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
SMF310.1 Apply the concept of integration to find the area ,Mean value and Root Mean Square values			
1	**Indefinite Integrals** Definition, Standard formulae Rules of Integration(without proof), Examples 1.3 Integration by substitution, 1.4 Integration by parts, 1.5 Integration by partial fractions	**12**	**20**
SMF310.1 Apply the concept of integration to find the area ,Mean value and Root Mean Square values			
2	Definite Integrals 2.1 Definition, Examples 2.2 Properties of Definite Integration (without proof), Examples based on properties	**06**	**10**
SMF310.1 Apply the concept of integration to find the area ,Mean value and Root Mean Square values			
3	Application of Integration 3.1 Area under the curve and 3.2 Area between two curves 3.3 Mean value & R.M.S. value of a function	**06**	**10**
	Total	**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.
2.In each topic, corresponding applications will be explained.

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
SMF310.2 Solve Differential equation of first order and first degree by various methods			
4	**Differential equations** 4.1 Definition of differential equation 4.2 Order & degree of Differential equations 4.3 Solutions of Differential equations of first order & first degree of following types 4.3.1 Variables separable 4.3.2 Homogenous Equation 4.3.3 Exact equations 4.3.4 Linear Equations	**10**	**16**
SMF310.3 Calculate Mean Deviation and apply the concept of Coefficient of Variance (C.V.) to compare two sets of data			
5	**Statistics -Measures of dispersion** 5.1 Mean deviation about MEAN 5.2 Standard deviation 5.3 Standard deviation by Step deviation Method 5.4 Coefficient of Variance (C.V.) 5.6 Comparison of two sets by finding C.V.	**10**	**16**
SMF310.4 Solve problems on Probability using addition theorem			
6	**Probability** 6.1 Mathematical definition of Probability of any Event 6.2 Addition Theorem of Probability 6.3 Examples	**04**	**08**
	Total	**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.
2.In each topic corresponding applications will be explained

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

Topic No.	Name of topic	Distribution of marks (level wise)			Course Outcome	Total Marks
		Remember	Comprehension	Application		
1	Indefinite Integrals	4	6	10	SMF310-1	20
2	Definite Integrals	2	2	6	SMF310-1	10
3	Application of Integration	--	--	10	SMF310-1	10
4	Differential equations	2	4	10	SMF310-2	16
5	Statistics	2	4	10	SMF310-3	16
6	Probability	1	4	3	SMF310-4	8

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) 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)	CO
1	Indefinite Integrals	To evaluate Integration using standard formulae, To evaluate Integration using Substitution Method	SMF310-1
2	Indefinite Integrals	To evaluate Integration of Various forms.	SMF310-1
3	Indefinite Integrals	To evaluate Integration using by Parts rule and Partial fraction method	SMF310-1
4	Definite Integrals	To evaluate Define Integration for various forms and using	SMF310-1
5	Application of IntegratioN	Apply Integration concepts to find Area ,Mean value, RMS value	SMF310-1
6	Differential equations	To determine Order and Degree of D.E.. Examples on V.S. form , Homogeneous form	SMF310-2
7	Differential equations	Examples on Linear of D.E and Exact D.E.	SMF310-2
8	Statistics	Examples on Mean Deviation and standard deviation	SMF310-3
9	Statistics	Examples on standard deviation by step deviation method and C.V.	SMF310-3
10	Probability	Examples on Addition theorem	SMF310-4

INSTRUCTIONA STRATEGIES :

Instructional Methods:

1. Lectures and Demonstrations
2. Tutorials

Teaching and Learning resources:

1. Chalk board
2. Item Bank
3. Charts

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.	P.M.Patil and others	Applied Mathematics	Vision Publication, Pune
4.	Sameer Shah	Applied Mathematics	Tech-Max Publication, Pune
5.	P.N.Wartikar	Applied mathematics	Pune vidyarthi Griha Prakashan , pune
6	H.K.Dass	Higher engineering mathematics	S .Chand publication
7	B.S.Grewal	Higher engineering Mathematics	Khanna publication, New Delhi

b) Website

i) www.khanacademy.org
ii) www.easycalculation.com
iii) www.math-magic.com

COURSE ID:

Course Name : BASIC CIVIL ENGINEERING
Course Code : SMF 311
Course Abbreviation : FBCE

TEACHING AND EVALUATION SCHEME:

Pre-requisites : None.

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

Evaluation Scheme:

Component	Progressive Assessment		Semester end	
	Theory	TW/ PR	Theory	Oral
Duration	Two tests (1hour each)	Skill Test / Practical (2 Hours)	One paper (3 hours)	Oral
Marks	20 each	25	80	25

- * Assessment as per Pro-forma V and VI

Rationale:

In sugar industry storage of bagged sugar is as important as its production. A technologist working in Sugar Plant must know the factors related to the requirement and methods of construction of godowns for storage of bagged sugar. Since he has to work in coalition; some basic knowledge of Civil Engineering is essential. Therefore this subject is introduced in the curriculum so as to help the students in getting familiar with various aspects of basic Civil Engineering, such as knowledge of building construction, surveying, foundations, ingredients of concrete, Transportation, Irrigation, Environmental Engineering etc.

COMPETENCY: Apply principal of civil engineering to solve the engineering problem as follows:

Cognitive: Understand the principal of civil engineering to solve the engineering problem
Psychomotor: Draw sketches , layout site selection.
Affective: Attitude of 1) precision 2) accuracy 3) Safety 4) punctuality.

COURSE OUTCOMES:
SMF311-1 Decide types of stone masonry.
SMF311-2 List the different types of survey..
SMF311-3 Draw typical layout of water supply scheme.
SMF311-4 Draw different type of foundation.
SMF311-5 List the different material required for concrete.
SMF311-6 Select the site for godown.

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	Program Outcomes POs and PSOs											
	PO 1 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	2	-	-	-	--	-	2	1	1	1	1
SMF311-1	1	1	-	-	-	-	-	1	-	1	1	1
SMF311-2	1	1	-	-	-	-	-	1	1	-	1	1
SMF311-3	2	2	-	-	-	-	-	2	1	1	1	1
SMF311-4	1	1	-	-	-	-	-	1	-	1	1	1
SMF311-5	2	1	-	-	-	-	-	1	1	1	1	1
SMF311-6	2	1	-	-	-	-	-	2	1	1	1	1

Section I

Sr. no	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF311-1 Decide types of stone masonry.			
1	**Building Construction :-** 1.1 Component parts of the building. Stone Masonry - Requirements of good stone, Coursed rubble masonry, un coursed rubble masonry. 1.2 Brick masonry – Requirements of good bricks, English bond, Flemish bond.Pointing - Necessity Plastering, necessity Flooring – Shahabad, Tandoor, Mosaic, ceramic 1.3 Requirements of good woodDoors & windows (brief ideas) 1.4 Terms Related To Built Up Area.	09	12
Course Outcomes SMF311-2 List the different types of survey.			
2.	**Engineering Surveying -** 2.1 Concept Of Surveying & Levelling, use of dumpy level , List of various surveying instruments, Types Of Surveys According To Civil Engineering Projects e.g. Route Survey, Topographical , Contour Survey. (Only brief idea). 2.2 Transportation Engg.- Transportation System -Classification -- Highways, Railways, Waterways, Airways, 2.3 Classification Of Roads:- National Highways, State Highways, MDR, ODR, Village Roads. Cross Section of Highway in cutting and banking with their component parts. 2..4 Bridges – Necessity, component parts & their functions classification of bridges according to span, Railway – Permanent way – component parts & their functions.	5 4	8 6

Sr. no	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF311-3 Draw typical layout of water supply scheme.			
3.	**Environmental Engg. :--** 3.1 General Importance of Environmental Engg.. 3.2 Standard of Water quality. Necessity of water treatment 3.3 Typical Layout of Water Supply Scheme. Sanitary Engg. - House drainage plan of building & its sanitary units Types of plumbing system of drainage 3.4 Irrigation Engg. :- Definition of irrigation, necessity of irrigation & its advantages Type of Irrigation Projects - Major, Medium, And Minor - K.T. Weir, Bhandhara, Dams - Definition, purpose Canal - Definition, purpose.	3 3	8 6
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	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF311-4 Draw different type of foundation.			
4	FOUNDATION 4.1 Definition, purpose, Soil Exploration, Depth of foundation 4.2 Data about bearing capacity of different types of soils, under different situations 4.3Types of foundations - Shallow foundation, definition, footings- strap footing, combined footing, strip footing, mat foundation 4.4 Deep foundations, Necessity, type of pile foundations, Well foundation & Cassions ,Bearing Capacity - 4.5Ultimate, safe, allowable, Net bearing Capacity Machine foundations - I.S. Recommendations	10	16
Course Outcomes SMF311-5 List the different material required for concrete.			
5	CONCRETE - 5.1 Concrete operations collection of materials, batching, mixing, placing, compaction and curing etc. Materials required for concrete 5.2 Cement - Physical requirements, types. 5.3 Sand - Specification & requirements 5.4 Aggregate - specification and requirement. 5.5 Water - Role of water, water/cement ratio its importance, workability. 5.6 Grades of concrete : Ordinary concrete & controlled concrete . 5.7 Testing of concrete : Destructive and non destructive testing R.C.C. - Purpose of reinforcement types of reinforcement, 5.8 Specifications,Pre-stressed Concrete – Introduction	10	14
Course Outcomes SMF311-6 Select the site for godown.			
6	SUGAR GODOWN 6.1 Site selection for godowns and spray ponds for sugar industry. 6.2 Precautions to be taken during construction of Sugar godowns. 6.3 Roof for sugar godowns, Storage / Stacking of bagged sugar in godown, Sectional elevation of sugar godown with schematic Stacking. 6.4 Factors affecting dimensions and capacity of sugar godown,.	04	10
For setting of question paper, marks per topic should be 1.5 times the allotted marks 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			CO	Total Marks
		Remember	Under-standing	Application		
I/1	A) Building Construction	4	4	4	SMF311-1	12
I/2	B) Engineering Surveying	4	2	2	SMF311-2	08
	C) Transportation Engg	2	2	2		06
I/3	D) Environmental Engg	4	2	2	SMF311-3	08
	E) Irrigation Engg.	2	2	2		06
II / 4	1) Foundation	8	4	4	SMF311-4	16
II / 5	2) Concrete	8	4	2	SMF311-5	14
II/ 6	3) Sugar Godown	4	4	2	SMF311-6	10
		36	24	20		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.						

Laboratory experiences and related skills developed.

Sr. No.	Laboratory Experience	CO	Skills / Competencies to be developed
1.	Experiments on simple lifting machines : (any eight) 1. Consistency test on cement. 2. Initial and final setting time. 3. Fineness of sand. 4. Fineness on coarse and fine aggregate. 5. Aggregate impact value. 6. Aggregate crushing value. 7. Slump test. 8. Compaction factor test. 9. Crushing test on concrete. 10. Compaction test on cement. 11. Study of sugar gowdowns of nearby Sugar Industry 12 Study of method of storage of bagged sugar in nearby Sugar Industry 13. Study of spray pond in nearby Sugar Industry 14. Study of Effluent Treatment Plant in nearby Sugar Industry	SMF311-5	1.To enable students to know use of cement as a construction material . 2. To enable students to know behavior and use of concrete and its ingredients. 3.. Numerical and graphical data interpretation. 4.. Managing time to complete experiment in given period. 5. Working in a team. 6. Bagged sugar storing skills.

Criteria for Continuous Assessment of Term Work/Practical

Sr. no	Criteria	Marks allotted
1	Attendance and observation	5
2	Neat Diagrams	5
3	Timely Completion	5
4	Neat writing	5
5	Workmanship	5
	TOTAL	25

* Assessment as per Pro-forma III

Aims of Practical: -

1) To enable students to know various surveying equipments and their use for surveying .
2) To enable students to know various structural component of a building, roads, house drainage system, irrigation structure and functions of them.
3) To enable students to know use of cement as a construction material.
4) To enable students to know behavior and use of concrete and its ingredients.

List of Practicals

Section I

1) Visit to Bituminous Road
2) Visit to house drainage system of building.
3) Visit to building for learning component parts.
4) Survey practical- measurement of distance on ground by chaining and ranging -2 turns.
5) Study and use of Dumpy level – 3 turns.

Section II (any eight)

a) Consistency test on cement.
b) Initial and final setting time.
c) Fineness of sand
d) Fineness on coarse and fine aggregate.
e) Aggregate impact value and crushing value.
f) Slump test.
g) Compaction factor test.
h) Crushing test on concrete.
i) Compaction test on cement.
j) Visit to the nearby Sugar Industry to study ETP and Sugar Godowns.

Term Work :- Term work consist of journal containing above experiments.

Instructional Strategies:

1 .Lectures cum discussions .2 .Laboratory Experiences . 3 .Field visits . 4. Assignments.

Learning Resources :

1 .Chalk and boards . 2 .O.H.P. 3 .Charts . 4 .Models .5 Photographs.

REFERENCE BOOKS :-

1) Concrete Technology & Soil Mechanics - By Hondoo Puri
2) Concrete Technology & Soil Mechanics - By Wagholikar
3) Surveying - 1) B.C. Punmia 2) T.P. Kanetkar & Kulkarni
4) Civil Engg. Drawing - M.G.Shah, C.M. Kale, S.Y. Patil
5) Building Construction by 1) Rangwala 2) Sushilkumar
6) C.T.S.M. - S.M. Kulkarni
7) Basic Civil Engg By - G.K. Hiraskar.
8) Maintenance of Building By A.C. Panchdhari.

LEVEL – IV

COURSE ID:

Course Name : SUGAR ENGINEERING
Course Code : SMF 401
Course Abbreviation : FSUE

TEACHING AND EVALUATION SCHEME:

Pre-requisites: SME 302 FBSE

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	02	04
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral *	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL	T W	
Marks	20 each	--	80	25	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

Sugar Engineers have vital role in human life. Today's fast lifestyle of human is complimented in great Sugar Production Manager have to work with various power producing & power absorbing devices like Mills, Boilers, Turbines, Compressors, Pumps etc. In order to apply the knowledge of principles concept of energy, work, heat & conversion between them in line with these devices, it is important to study and understand the Mill Capacity Calculation, Heat and Steam Balance Calculation in Sugar Industry.

This Course is dealt with the Power requirement, Water and Steam requirement for process, energy efficiency and other engineering aspects essential for a Sugar Production Manager. It also includes the study of various sources of energy, Power Plants to enhance the knowledge with respect to the new emerging concept of Co-generation Plant.

COMPETENCY:

Applying the knowledge to understand the mill capacity calculation, heat &steam balance calculations in sugar industry as follows:

Cognitive: Understand and applying principle, energy, work, heat & conversion to engineering problems.
Psychomotor: i) Calculating skills ii) operating skills iii) Maintenance skills
Affective: Attitude of i) Precision ii) Accuracy iii) Safety iv) Punctuality.

COURSE OUTCOMES:

SMF401-1 Explain the construction of milling, maintenance of mill operation.
SMF401-2 Explain the water management in S.I.
SMF401-3 Generate awareness of instrument used in S.I.
SMF401-4 Explain the construction, working & maintenance of boiler and analysis of boiler water.
SMF401-5 Classify steam turbine and steam, Steam requirement in sugar factory.
SMF401-6 Generate awareness of power generating equipments in S.I.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying the knowledge of principle concept of energy, work, heat & conversion	2	2	1	-	-	1	-	2	2	1	2	2
SMF401-1 Explain the construction of milling, & maintenance of mill operation.	2	2	1	-	-	1	-	2	2	1	2	2
SMF401-2 Explain the water management in S.I.	1	1	1	-	-	1	-	2	2	1	2	2
SMF401-3 Generate awareness of instrument used in S.I	2	2	-	-	-	1	-	2	2	1	2	2
SMF401-4 Explain the construction, working & maintenance of boiler and analysis of boiler water	2	2	-	-	-	1	-	2	2	1	2	2
SMF401-5 Classify steam turbine and steam, Steam requirement in S.I.	2	2	-	-	-	-	-	2	2	1	2	2
SMF401-6 Generate awareness of power generating equipments.	2	2	-	-	-	-	-	2	2	1	2	2

CONTENTS:

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF401-1 Explain the construction of milling, maintenance of mill operation.			
1	**MILLING OF SUGAR CANE** 1.1 Methods of drive Cane handling Equipments, Mills Construction, Hydraulic pressure system: Edwards Hydraulic Accumulator. 1.2 Mill Setting and Trash Plate Profile. Calculation of Mill Setting, Choice of Mill Speed, Method for Trash Plate Profile, Consideration of the Height of Trash Plate. 1.3 Trouble Shooting: Abnormal Noises, Squirting, Chokes, Cause of Chokes, Other Symptoms, Metal for Trash Plate. 1.4 Mill Drives: Steam Engines, Electric Drive of Mills, Mill drive by Steam Turbine, Governing, Power, Speed. 1.5 Description of Turbine, Oil supply unit, Rapid closing device, Speed Regulation, Putting Turbine into Operation: Commissioning, Supervision during operation, Stopping, Emergency Tripping, Maintenance of Turbine, Causes of Trouble and their removal, 1.6 Operation and Maintenance of Mill: Factors affecting efficiency of mill, Primary and Secondary extraction	**05**	**12**
Course Outcomes SMF401-2 Explain the water management in S.I.			
2	**WATER MANAGEMENT** 2.1 Introduction : Raw Water & its uses, Water from Sugar Cane & its utilization. 2.2 Requirement of water: before starting the plant, during normal running & schedule cleaning of plant. 2.3 Production of Condensate water, Factory Water Balance, Types of condenser. 2.4 Calculations for Capacity of Condenser, Cold water Requirement 2.5 Calculation for tail pipe diameter of the condenser, Spray Pond, Effluent water, Typical process chart of effluent recycling.		

Sr no	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF401-3 Generate awareness of instrument used in S.I.			
3	**INSTRUMENTATION AND SAFETY** 3.1 Introduction to indicating Instruments: Temperature, Pressure, Flow, Level, Specific purpose Instruments, Controllers. 3.2 Unit operations of Sugar Industry where controllers are essential, Operating condition and Duties of Instruments Operator. 3.3 Introduction to Industrial Safety: Causes of Accidents, Prevention, Personal Protective Devices and equipments.	03	08
	AIR COMPRESSORS 3.4 Industrial use of compressed air, Classifications of Air Compressor, 3.5 Important elements of reciprocating air compressor and rotary compressors 3.6 Comparison between Reciprocating and Rotary Compressor.	03	08
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	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF401-4 Explain the construction, working & maintenance of boiler and analysis of boiler water.			
4.	**BOILER** 4.1 Bagasse: Composition, Quantity, Storage, Use, Combustion and Calorific Value of Bagasse(GCV & NCV). 4.2 Furnace: Types, Combustion Chamber, Rotary feeder for bagasse furnace, Importance of Bagasse drying and its System 4.3 Heating Surface of Boiler and the Factors affecting Heating Surface of Boiler, Distribution of Heat Absorption. 4.4 Care of Water Tubes , Super Heaters, Economizers, Types of Air Heaters, Draught , Chimney. 4.5 Operation and Maintenance of Boilers, Boiler parameter, Hydraulic test of boiler & its check list. 4.6 Precaution to be taken before and after Test, Pre-Commissioning Inspection, Safety Precautions, Routine Operation of Boiler Plant. 4.7 Procedure to start, Lighting up when hot, Soot Blowing, Safety Rules, Types of Blowing Down and precautions, Carry over and their factors. 4.8 Effect of power failure, Thermal efficiency of Rankin Cycle.	**06**	**14**
	BOILER WATER 4.9 Impurities in Water, Effects of Impurities, Use of Condensate, Significance of Control, Analytical Control. 4.10 Quality of water for Boiler feed water and boiler water. 4.11 Methods of Feed water and Boiler Water Treatment (Internal and External).	**03**	**08**
Course Outcomes SMF401-5 Classify steam turbine and steam, Steam requirement in sugar factory.			
5	**STEAM GENERATION** 5.1 Quantity of Steam obtainable, Classification – description & working of extraction & condensing type turbines types of steam. 5.2 Characteristics of steam for use in turbine, Steam Available from Bagasse. 5.3 Sugar Mill Steam Requirements, (prime mover energy requirement, Balance between High pressure and exhaust steam requirements, Steam Losses), Process Steam Usage (evaporation configuration, Pan & Juice Heating requirement). 5.4 Options for reducing process steam usage, Overall steam Balance(Exhaust steam usage, Other Factors affecting the steam Balance). 5.5 Steam Pressure Reducing Valve, Function & types of Steam Traps.	**05**	**12**

Course Outcomes SMF401-6 Generate awareness of power generating equipments in S.I			
6	**POWER HOUSE** 6.1 Generation of Electricity: Factory Requirements, Parameters, Constructional aspects of condensing turbine used in sugar industry, De-superheating, Steam usages. 6.2 Introduction to Alternators and its type used in sugar industry, control equipment for Alternator. 6.3 Importance of Lubrication & cooling, Operation of the power house: Monitoring of Alternator & Turbine. 6.4 Class of electric motors used in Sugar Industry, Function of Transformers used in Sugar Industry, Cogeneration & export of Power.	**02**	**06**
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	co	Distribution of marks (level wise)			Total marks
			Remember	Understand	Application	
I / 1	MILLING OF SUGAR CANE	SMF401-1	04	04	04	12
I / 2	WATER MANAGEMENT	SMF401-2	04	04	04	12
I / 3	INSTRUMENTATION AND SAFETY	SMF401-3	04	02	02	08
	AIR COMPRESSORS		04	02	02	08
II / 4	BOILER	SMF401-4	04	04	06	14
	BOILER WATER		04	04	--	08
II / 5	STEAM GENERATION	SMF401-5	04	04	04	12
II / 6	POWER HOUSE	SMF401-6	04	02	--	06
			32	26	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.						

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	Skills developed	CO
01	To Study the Mill house construction.	To identify and understand the function of various component of Mill Tandem.	SMF401-1
02	To work out the Condensate Water Requirement of a selected Sugar Plant.	To observe and understand the function of various Cane Carrier.	SMF401-2
03	To work out the Steam Balance and Heat Balance of a selected Sugar Plant. (Steam Requirement for Process)	To analyze the performance of Boiler on the basis of TCD of the Factory Visited	SMF401-5
04	To work out the Steam Requirement for Juice Heating, Evaporator, Pan	To develop ability to analyze the performance of Steam consuming Units in Sugar Industry.	SMF401-5
05	To know Industrial measurement Lab	To obaerve performance of Various Instruments.	SMF401-3
06	To measure pressure using Boudon's tube pressure gauge.	---do ---	SMF401-3
07	Calibration of Pressure gauge by using dead weight pressure gauge tester.	---do ---	SMF401-3
08	Flow rate measurement by using rotameter/ Orifice/ Venturi Tube.	To develop ability to analyze the performance of Condenser and Vacuum System in Sugar Industry.	SMF401-3
09	To identify the components of reciprocating air compressor and demonstrate its working with the help of model / chart.	To develop ability to analyze the performance of an air compressor.	SMF401-3
10	Visit to Sugar plant.	To understand practically working of the above air and steam consuming units in Sugar Plant. To understand and observe safety measures.	SMF401-1

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

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

Instructional strategies:

a) Lectures and discussions.
b) Laboratory experiences and laboratory interactive sessions.
c) Time bound assignments.

Teaching and Learning resources, including references:

a) Chalk-board.
b) Demonstrative kits.
c) Demonstrative charts.

Books:

- Training Manuals for Sugar Mills By Mangal Singh
- Cane Sugar Manufacture in India by D P Kulkarni
- Cane Sugar Engineering By Peter Rein
- Hand Book of Cane Sugar Engineering by E Hugot.

Criteria for assessment at semester end practical exam:

Sr. no	Criteria	Marks allotted
1	Correct figures / diagrams	05
2	Observation tables	05
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	05
	Total	25

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

COURSE ID:

Course Name : SUGAR MANUFACTURING - I.
Course Code : SMF 402
Course Abbreviation : FSUM-I

TEACHING AND EVALUATION SCHEME:

Pre-requisites: None.

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	3	6
Practical	3	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Practical*	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	Practical Exam (2hours)	T W	
Marks	20 each	--	80	25*	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

Sugar Technology–I basically dealt with the Technology of manufacture of Sugar, which includes mechanical, chemical processes as well as various unit operations: such as Extraction of juice, Milling, Juice heating Clarification Methods, Preparation of clarifying Agents, Separation of Mud, Evaporation, Types of evaporators ,etc.

This course is introduced to understand the various steps involved in the process of Sugar manufacture and apply the best suitable Techniques for the production of Quality Sugar.

COMPETENCY: To develop knowledge of sugar manufacturing process to operate the equipment.

Cognitive: Understand principles and apply knowledge to operate the equipment.

Psychomotor: Operate Juice heater subside vacuum after evaporator; calculate RS from molasses, juice & jaggery**.**

Affective: Attitude of 1) accuracy 2) Safety 2) Punctually

COURSE OUTCOMES:

SMF402-1 Explain construction, working of juice heater with sketch & factor affecting Juice heating.

SMF402-2 Explain construction, working of subsidation & filtration process.

SMF402-3 Understanding Relliux principles and application in multiple effect evaporator.

SMF402-4 Know and recognize equipment used in evaporation

SMF402-5 Know & recognize equipment in pan boiling.

SMF402-6 understanding principles of vacuum pan boiling

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Organize	PSO2 Production & Management
Competency	2	3	2	1	-	-	-	2	2	2	3	2
SMF402-1	1	2	2	1	-	-	-	2	2	2	3	2
SMF402-2	2	2	2	1	-	-	-	2	2	2	2	2
SMF402-3	2	3	2	1	-	-	-	2	2	2	2	2
SMF402-4	1	3	2	1	-	-	-	2	2	1	3	2
SMF402-5	2	2	2	1	-	-	-	2	2	1	2	2
SMF402-6	3	3	2	1	-	-	-	2	2	2	2	2

Section I

Sr. No.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF402-1 Explain construction, working of juice heater with sketch & factor affecting Juice heating.			
1	**JUICE HEATING** 1.1 Purpose of juice heating, 1.2 Mode of heating, Raw juice heating, sulphur juice heating, 1.3 Factor affecting juice heating, Rapid flow of juice and steam, Effect Non-condensable gases.	**06**	**10**
Course Outcomes SMF402-2 Explain construction, working of subsidation & filtration process.			
2	**SUBSIDATION** 2.1Introduction, purpose of Subsidization, Precipitated impurities 2.2 Types of Clarifier 2.3 Possible causes of high mud level, Liquidation process or holdover juice. **FILTRATION** 2.4Mechanism of filtration, Types of filter, Bagasse fines, mixing fines with settlings, Pickup vacuum, Wash vacuum, Washing of cake, cake pol. 2.5Decanter.	**08**	**14**
Course Outcomes SMF402-3 Understanding Relliux principles and application in multiple effect evaporator.			
3	**EVAPORATION** 3.1Principle of evaporation by steam, Relliux Principles of evaporation. 3.2 Single and multiple effect evaporation, multiple effect evaporator arrangement 3.3 Vapor bleeding arrangement, Scale Formation, Nature of scale, Reasons for deposition, Composition of scale. 3.4 Liquidation of set, Entrainment, Incondensable gas removal, Syrup sulphitation.	**10**	**16**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
	Course Outcomes SMF402 Know and recognize equipment used in evaporation		
4	**MODERN EQUIPMENTS** 4.1 Vapor Cell, Semi Kestener Evaporator, Double Effect evaporator, Falling Film and Rising Film, Type Evaporator. **CONCENTRATION OF JUICE** 4.2 Principle, Concentration of juice in vacuum, Concentration performed in two stages 4.3 Decomposition of Sucrose during evaporation, Calculation of water evaporated, Creation of vacuum.	**10**	**18**
	Course Outcomes SMF402-5 Know & recognize equipment in pan boiling.		
5	**VACUUM PAN** 5.1 Principles of vacuum pan, Types of pan, Important features and advantages of Continuous pan. 5.2 Circulation in pan, Concept of Pan automation.	**04**	**08**
	Course Outcomes SMF402-6 understanding principles of vacuum pan boiling		
6	**CRYSTALIZATION BY EVAPORATION** 6.1 Principles involved in Pan boiling: Solubility, Saturated solution, Solubility Coefficient, Super saturation, Super saturation Coefficient. 6.2 Different zones of Super saturation, 6.3 Factors affecting rate of crystallization, 6.4 Factors affecting boiling point elevation. 6.5 Mechanism of boiling: Circulation of Massecuite, Effect of hydrostatic head, Heat injury to massecuite / sugar crystals.	**10**	**14**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Specification table for setting question paper for semester end theory examination

Section / Topic	Name of Topic	CO	Distribution of marks (level wise)			Total Mark
			Remember	Understand	Application	
I / 1	JUICE HEATING	SMF402-1	02	06	02	**10**
I / 2	SUBSIDATION & FILTRATION	SMF402-2	06	08	--	**14**
I / 3	EVAPORATION	SMF402-3	04	06	06	**16**
II / 4	MODERN EQUIPMENTS CONCENTRATION OF JUICE FILTRATION	SMF402-4	02	08	08	**18**
II / 5	VACUUM PAN	SMF402-5	04	04	--	**08**
II/6	CRYSTALIZATIO BY EVAPORATION	SMF402-6	06	06	02	**14**
			24	38	18	**80**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.						

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
1	To determine the reducing sugars in the given sample Cane juice by Lane Eyon & Method.	SMF402-1	To develop ability of analyzing various parameters required in Sugar Analysis w. r to understand the various Sugar Boiling Scheme. To develop ability of handling various chemicals and apparatus.
2	To determine the reducing sugars in the given sample jaggery by Lane Eyon & Method.	SMF402-1	
3	To determine the reducing sugars in the given sample molasses by Lane Eyon & Method.	SMF402-1	
4	To determine the CaO content in the given sample (Cane juice by EDTA Method.	SMF402-3	
5	To determine the Sucrose % in the given sample by 1. Double Polarization Method by Jackson & Gills	SMF402-2	
6	To determine the Cao contain in lime.	SMF402-2	
7	To determine the Co2 containing lime by oxalate apparatus.	SMF402-2	
8	To determine moisture % in sulphur.	SMF402-2	

Criteria forAssessment : Practical Work and Semester End Practical Exam:

Sr. no	Criteria	Continuous Assessment	Progressive Skill Test	Performance of Term End
1	Attendance	30	02	05
2	Preparedness and Involvement in Practical	20	03	05
3	Correct figures / Diagrams/ Neatness/Presentation	15	06	05
4	Result/Table / Calculations / Graphs/Observations	15	06	05
5	Safety / Use of Proper Tools / Workmanship.	20	08	05
	Total Marks	100	25	25

Instructional strategies:

1) Lectures, Laboratory experiences, interactive sessions and discussions.
2) Time bound assignments.
3) Factory Visits.

Teaching and Learning Resources, including References of Books:

1) Chalk & Black-Board
2) OHP/ LCD
3) Slides/Photos/Video Clips
4) Books:
   1) Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
   2) Introduction to Cane Sugar Technology -By Jenkins.
   3) Handbook of Cane Sugar Technology -By Spencer & Meade.
   4) Handbook of Cane Sugar Engineering -By E Hugot

COURSE ID:

Course Name : SUGAR MANUFACTURING - II.
Course Code : SMF 403
Course Abbreviation : FSUM-II

TEACHING AND EVALUATION SCHEME:

Pre-requisites: SMF 402 FSUM-I

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	3	6
Practical	3	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Practical*	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	Practical Exam (2hours)	T W	
Marks	20 each	--	80	25*	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

To obtain sugar in crystallized forms, certain boiling techniques and schemes and the crystallization methods are adopted. This subject dealt with the theory of Sugar Boiling. The methods of boiling sugar and crystallization used in sugar industry are taught in this course. A brief study of different types of sugar is also included in this course.

COMPETENCY:
Develop skill to obtain sugar in crystallized form by certain boiling techniques .Design Pan

Cognitive: Understand crystallization & centrifugation process and apply in plant.
Psychomotor: Draw massecuite boiling process flow chart and take decision application of boiling scheme.
Affective: Attitude of 1) precision 2) accuracy 3) Safety. 4) Punctuality.

COURSE OUTCOMES:

SMF403-**1** Classify graining methods, boiling schemes precautions for different M/C
SMF403-**2** Calculate pan capacity of solid balance. Draw flow chart & M/C boiling scheme.
SMF403-**3** Calculate purity of M/C molasses and sugar. Understand use of molasses to M/C boiling.
SMF403-**4** Understand principles of crystallization M/C treatment precautions.
SMF403-**5** Understand & apply principles to caring and purging
SMF403-**6** Understand quality grading & storage of sugar.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	2	1	-	-	-	-	2	1	1	2	2
SMF403-1	2	2	2	-	-	-	-	2	1	1	2	2
SMF403-2	2	2	1	-	-	-	-	2	1	1	2	2
SMF403-3	2	2	1	-	-	-	-	2	1	1	2	2
SMF403-4	2	1	1	-	-	-	-	2	1	1	2	2
SMF403-5	2	2	1	-	-	-	-	2	1	1	2	2
SMF403-6	2	1	1	-	-	-	-	2	1	1	2	2

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF403-**1** Classify graining methods boiling schemes precautions for different M/C			
1	MEATHODS OF GRAINING: 1.1 Waiting method, shock seeding method, True seeding method, 1.2 Boiling to grain, Precaution to be taken during A m/c , B m /c, Cm/c boiling. 1.3 Selection of Boiling scheme. 1.4 False grain formation and their causes. 1.5Entrainment, Vacuum condition. 1.6 Preparation of slurry and their proportion.	**08**	**14**
Course Outcomes SMF403-**2** Calculate pan capacity of solid balance. Draw flow chart & M/C boiling scheme.			
2	CALCULATIONS: 2.1 Cobenzes Diagram, Solid balance, Expected purity of massecuite. 2.2 Capacity of pan & other calculations. BOILING TECHNIQUES AND SCHEME 2.3 Types of different boiling scheme: Two, Three , Three and Half & Four etc.	**10**	**16**
Course Outcomes SMF403-**3** Calculate purity of M/C molasses and sugar. Understand use of molasses to M/C boiling.			
3	MASSEUITE AND EXHAUSTED MOLASSES 3.1 Different types of massecuite (A, B & C) and respective malasses, their percentage & purities, 3.2Sources of molasses, Composition of exhausted molasses, loss of sucrose in molasses, molasses conditioing, Utilization of exhausted molasses. 3.3 Causes of conglomeration, and dextran formation,	**06**	**10**
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	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF403-**4** Understand principles of crystallization M/C treatment precautions.			
4	CRYSTALIZATION BY COOLING 4.1Introduction,Principles involved in crystallization. 4.2 Precaution to be taken during crystallization. 4.3Massecuite treatment: Natural cooling, water cooling, Re-heating, ("C"Massicuite treatment, Warming of low grade massecuite)	**08**	**12**
Course Outcomes SMF403-**5** Understand & apply principles to caring and purging			
5	CURING AND PURGING OF MASSECUITE 5.1 Introduction, Principles involved in centrifuging operation. 5.2 Types of centrifugals, Cycles of operation, Time cycle. 5.3 Factors affecting time cycle of machine, Curing / purging system for high grade & low grade massecuite. 5.4 Advantages & disadvantages, Grain breakages.	**08**	**12**
Course Outcomes SMF403-**6** understand quality grading & storage of sugar.			
6	SUGAR DRYING AND GRADDING 6.1 Purpose of Drying and Grading, Drying of Sugar in centrifugal machine and Sugar conveyors. 6.2 Importance of drying in keeping quality, Sieving and Grading of sugar. SUGAR STORAGE AND PACKING 6.3 Composition of sugar, Sugar storage conditions. 6.4 Guidelines for storage of sugar: safety factor, Dilution indicator, sugar packing mode, Keeping sugar dry. 6.5 Stacking of sugar bags, Sugar Godowns, 6.6 Deterioration of sugar, causes of deterioration, Preventing deterioration, Effect of inversion and fermentation, Action of microorganisms. 6.7 Packing Material, Export quality sugar norms / specifications.	**08**	**16**
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	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	MEATHODS OF GRAINING	SMF403-1	06	04	04	**14**
I / 2	CALCULATIONS: BOILING TECHNIQUES AND SCHEMES	SMF403-2	06	04	06	**16**
I / 3	MASSECUITE AND EXHAUSTED MOLASSES	SMF403-3	04	04	02	**10**
II / 4	CRYSTALIZATION BY COOLING	SMF403-4	04	06	02	**12**
II / 5	CURING AND PURGING OF MASSECUITE	SMF403-5	04	06	02	**12**
II / 6	SUGAR DRYING AND GRADING SUGAR STORAGE AND PACKING	SMF403-6	06	08	02	**16**
			30	32	18	**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.

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
1	To determine the purity of the A massecuite.	SMF403-3	Handling of high purity materials for purity crystal size etc. Skills of dosing slurry at proper stage of mother liquor. Basic components, radicals in materials, Quality of chemicals and their constituents, Skills in jaggery manufacturing with and without Instruments.
2	To determine the purity of the B massecuite	SMF403-3	
3	To determine the purity of the C massecuite	SMF403-3	
4	To determine the purity of the AH,BH,CL,FM.	SMF403-3	
5	To determine the Crystal and massecuite by Non sugar method / Purity Method Ash Method / Lab Centrifuge method	SMF403-5	
6	To determine the carbonated ash & Sulphited ash in the given sample.	SMF403-5	
7	To determine the viscosity of given sample by Viscometer.	SMF403-3	
8	To determine the size of crystal in the given sample of seed, slurry and massecuite.	SMF403-4	
9	To determine the grade of the given sample of sugar.	SMF403-6	
10	To study Open Pan Boiling through a process of Jaggery manufacture	SMF403-4	

Criteria forAssessment : Practical Work and Semester End Practical Exam:

Sr. no	Criteria	Continuous Assessment	Progressive Skill Test	Performance of Term End
1	Attendance	30	02	05
2	Preparedness and Involvement in Practical	20	03	05
3	Correct figures / Diagrams/ Neatness/Presentation	15	06	05
4	Result/Table / Calculations / Graphs/Observations	15	06	05
5	Safety / Use of Proper Tools / Workmanship.	20	08	05
	Total Marks	100	25	25

Instructional strategies:

1) Lectures, Laboratory experiences, interactive sessions and discussions.
2) Time bound assignments.
3) Factory Visits.

Teaching and Learning Resources, including References of Books:

1) Chalk & Black-Board
2) OHP/ LCD
3) Slides/Photos/Video Clips
4) Books:

1) Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
2) Introduction to Cane Sugar Technology -By Jenkins.
3) Handbook of Cane Sugar Technology -By Spencer & Meade.
4) Handbook of Cane Sugar Engineering -By E Hugot

COURSE ID:

Course Name : BY-PRODUCTS OF SUGAR INDUSTRY
Course Code : SMF 404
Course Abbreviation : FBPS

TEACHING AND EVALUATION SCHEME:

Pre-requisites: None.

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	2	4
Practical	2	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral *	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL	T W	
Marks	20 each	--	80	25*	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

In any process Industry normally raw material is processed through various operation for getting a final product. During such operation and process some intermediate products also formed along with waste, may be useful or useless. Sugar is main product of the Sugar Industry but we get three main by products form the process. The importance of by-products is more, as they can be used as a raw material for many other industrial useful products.

The main purpose of this course is to deal with the Allied Sugar Manufacture & Co-Products,their industrial utilization and environmental concern.

COMPETENCY:

Applying knowledge of byproducts from S.I. & Utilization as alternatives are as follows:
Cognitive: Understand applications of byproducts of S.I. to recover other useful co-products.
Psychomotor: i) Processing skills ii) operating skills
Affective: Attitude of i) Precision ii) Accuracy iii) Safety iv) Punctuality.

COURSE OUTCOMES:

SMF404-1 Analyze the significance & utilization of bagasse with its composition.
SMF404-2 Understand the various manufacturing processes from bagasse & Molasses
SMF404-3 Analyze the significance & utilization of filter mud & cane wax with its composition
SMF404-4 Understand the specification, reprocessing of raw sugar.
SMF404-5 Analyze the concept & importance of environmental impact.
SMF404-6 Analyze the controlling measures for pollution control in S.I.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying knowledge of byproducts from S.I.	2	2	1	-	2	2	-	1	1	1	2	2
SMF404-1 Analyze the significance & utilization of bagasse with its composition.	2	2	1	-	2	2	-	1	1	1	2	2
SMF404-2 Understand the various manu. processes from bagasse & Molasses	2	1	1	-	2	2	-	1	1	1	2	1
SMF404-3 Analyze the significance & utilization of filter mud & cane wax with its composition	2	2	1	-	2	1	-	1	1	1	1	2
SMF404-4 Understand the specification, reprocessing of raw sugar.	2	2	1	-	2	1	-	1	1	1	1	1
SMF404-5 Analyze the concept & importance of environmental impact	2	1	1	-	3	2	-	1	1	1	1	2
SMF404-6 Analyze the controlling measures for pollution control in S.I	2	1	1	-	2	2	-	1	1	1	2	2

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcome SMF404-1 Analyze the significance & utilization of bagasse with its composition.			
1	BAGASSE Definition, Composition of bagasse, Fibre, Bagasse cellulose, Anatomical structure of bagasse, True fibre and Pith, Utilization of bagasse as fuel, Calorific Value of Bagasse, Availability of bagasse, Handling and Storage of bagasse, Role and Cost of bagasse as raw material in Combined Heat & Power Syatem.	**03**	**08**
	FIBROUS PRODUCTS Manufacturing of Pulp and Paper, Soda Process and Sulphate process, Paper board Process, Comparison, Schematic flow sheet of Fibre-Board and Particle Board manufacture, Characteristics of waste effluent from Paper Mill and its treatment.	**05**	**12**
Course Outcome SMF404-2 Understand the various manufacturing processes from bagasse & Molasses			
2	MOLASSES Composition of molasses, Utilization of Molasses, Alcoholic fermentation of molasses, Production of rectified Sprit, Production of absolute alcohol, Production of cattle feed, Production of Acetic acid, Characteristics of waste effluent from distillery and its treatment.	**05**	**12**
Course Outcome SMF404-3 Analyze the significance & utilization of filter mud & cane wax with its composition			
3	FILTER MUD AND CANE WAX Characteristics of filter cake, Composition and utilization of Filter mud, Filter mud as a fertilizer, as animal feed, Cane wax form filter mud, Extraction of cane wax, plant Process for extraction of wax, use of wax.	**03**	**08**
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	Teaching (Hours)	Theory evaluation Marks
Course Outcome Course Outcome SMF404-4 Understand the specification, reprocessing of raw sugar.			
4	**Raw Sugar:** 4.1 Specification of raw sugar, clarification & pan boiling. 4.2 Storage, handling, transport of raw sugar, keeping quality. 4.3 Quality criteria for Purchase of raw sugar. 4.4 Raw sugar reprocessing in Indian context. 4.5 Non Centrifugal Sugars: Manufacture of Jaggery & Khandasari Sugars, advantages & disadvantages..	**02**	**06**
Course Outcome Course Outcome SMF404-5 Analyze the concept & importance of environmental impact.			
5	**Major aspects and Causes of Pollution:** 5.1 Types, Sources of Waste and Effluent from various sources in sugar factory. 5.2 Segregation of Effluents. 5.3 Pollution Effect: Waste Water, Solid Waste, Air Pollution, Molasses, **Nature of Pollution from Sugar Industry:** 5.4 Characteristics and Prameters of waste from Sugar factory and Distillery. 5.5 Waste Origin and Waste Type. 5.6 Steps to be taken at different Stations of Sugar Mill so as to reduce Pollution at: Cane Yard, Cane Carreir, Milling Stations, Boilers, Boiling House, Entrainment from Pans & Evaporator, Sulphitation, Liming Stations, Crystalization Station,	**09**	**22**
Course Outcome Course Outcome SMF404-6 Analyze the controlling measures for pollution control in S.I			
6	**Pollution Control In Sugar Industry:** 6.1 Pollution Prevention Measures / Activities from the point of Good Operating Practices. 6.2 Good House Keeping Practices. 6.3 Concept of effluent treatment plants, Treatment of Sugar waste effluent: Primary Treatment, Secondary (Biological) Treatment, Tertiary Treatment (Biological). 6.4 Waste water reduction and Recovery of material from process Effluent. 6.5 Profile for requirement of Air pollution control equipments for sugar industry, Profile for requirement of Water pollution control equipments for sugar industry and distillery.	**05**	**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.			

Specification table for setting question paper for semester end theory examination

Section / Topic	Name of topic	CO	Distribution of marks (level wise)			Total marks
			Remember	Understand	Application	
I / 1	BAGASSE	SMF404-1	02	02	04	08
	FIBROUS PRODUCTS	SMF404-1	02	04	06	12
I / 2	MOLASSES	SMF404-2	02	04	06	12
I / 3	FILTER MUD AND CANE WAX	SMF404-3	--	04	04	08
II / 4	RAW SUGAR	SMF404-4	00	04	02	06
II / 5	MAJOR ASPECTS AND COUSES OF POLLUTION	SMF404-5	04	04	02	10
	NATURE OF POLLUTION FROM SUGAR INDUSTRY	SMF404-5	06	04	02	12
II / 6	POLLUTION CONTROL IN SUGAR INDUSTRY	SMF404-6	04	04	04	12
			20	30	30	80

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
1	Determination of Pol. % and Moist % of Bagasse.	SMF404-1	To handle different quality samples of by-products of sugar industry. To understand the method of analysis of determining the parameter having environmental significance. To know environmental significance of pH, TDS, COD, BOD, DO etc. and realize the impact of various type of air & water pollutants on environment.
2	Determination of oil and Grease in given water sample.	SMF404-5	
3	Determination of mosture % and Pol % filter Cake.	SMF404-1	
4	To determine Brix, Pol and Purity of Final Molasses.	SMF404-2	
5	To determine Total Sugars in Molasses.	SMF404-2	
6	Determination of pH, of of given effluent sample.	SMF404-5	
7	Determination of total solids, total suspended solids, total dissolved solids of given effluent sample.	SMF404-5	
8	Determination of dissolved oxygen in effluent sample.	SMF404-5	
9	Determination of B O D in given effluent sample.	SMF404-5	
10	Assignments:(Minimum Two: One from each Section) **Section-I** Prepare a report of By-products of any near-by Sugar Industry visited and their utilization / disposal. Prepare a report of By-product's utilization / disposal of any near-by Sugar Industry visited. Visit & Prepare a report of Industry using Molasses / Filter Cake/ Bagasse as a Raw Material and their utilization. **Section-II** Prepare a visit report of effluent treatment plant of any Sugar Industry or Distillery visited. Visit the Sugar industry / Distillery and prepare a report on pollution control devices & equipments. Visit the pollution control laboratories of state pollution control board prepare a report on laboratory testing devices. Prepare an environment audit report / an environment impact assessment report for any Industry.	SMF404-5	Understand the process of utilization / disposal of inter-mediate Products. Learn Industrial environment and Work Culture. Understanding roles of Engineer and their Responsibility. Development of various skills and abilities like Interpersonal skills, Communication, Listening and Observation skills by interacting with Managers/ Engineers/ Supervisors/ Operators and Developing Study skills and Writing Skills(Technical Reports/Project, Event reporting) by gathering primary/secondary data/information through various sources. Develop special skills Self-Awareness, Improving Personal Memory & Self-Confidence, Rapid reading, Notes taking, Public speak, Use of Presentation graphics, , Managing time, , that include Creativity, Etiquettes in social as well as Office settings, Telephone Etiquettes, Civic Sense.

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05
	Total	25

Instructional strategies:

1) Lectures and discussions.
2) Laboratory experiences and laboratory interactive sessions.
3) Time bound assignments.
4) Factory Visits.

Teaching and Learning Resources, including References of Books:

1) Chalk & Black-Board
2) O.H.P.
3) Slides
4) Video Films.
5) Books:
   1) Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
   2) Introduction to Cane Sugar Technology -By Jenkins.
   3) Handbook of Cane Sugar Technology -By Spencer & Meade.

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
	Total	25

Assessment for Semester End Practical Exam as per Pro-forma II.

COURSE ID:

Course Name : SUGAR CHEMICAL CONTROL
Course Code : SMF 405
Course Abbreviation : FSCC

TEACHING AND EVALUATION SCHEME:

Pre-requisites: None.

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	2	4
Practical	2	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral *	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL	T W	
Marks	20 each	--	80	25	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

For Sugar Technologist it is vital to analyze various intermediate products in laboratory to avoid losses and to get higher recovery of final product. In this subject, students will learn and practice the actual methods of analysis and theory behind the methods. As well as, he can use different formulae and calculate efficiency figures using data obtained. Lot of data is collected from milling, Boiling house and boiler sections and using different technical formulae, reports are filled in, which are represented systematically and scientifically in order to send to the Management, Government authorities etc.

COMPETENCY: Apply the knowledge & formulae to calculate Efficiency figures.

Cognitive:.1) Understand different formulas and apply to calculate efficiency figures.
2) Understand techniques of presenting different reports.

Psychomotor:. Handling of lab. Equipments & apparatus.

Affective: Attitude of 1) precision 2) accuracy 3) Safety.

COURSE OUTCOMES:

SMF405-1 Draw brix curves &write interpretation of brix curve.
SMF405-2 Solve problems on Mill Extraction & calculate pol in cane.
SMF405-3 Explain the concept of Rapi Pol Extractor &calculate pol % &Recovery.
SMF405-4 Calculate available sugar &molasses from massecuite &molasses.
SMF405-5 Apply basic formulae to calculate BHR, RBHR, Actual & Theoretical molasses.
SMF405-6 Explain the role of Chemist & contents of different reports generated.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	3	2	-	-	-	-	3	1	3	2	3
SMF405 -1	2	2	3	-	-	-	-	2	1	2	2	2
SMF405 -2	2	3	2	-	-	-	-	3	1	2	2	2
SMF405 -3	2	2	3	-	-	-	-	2	1	2	2	2
SME 405-4	2	2	3	-	-	-	-	2	1	2	2	2
SME405 -5	2	2	-	-	-	-	-	2	1	2	1	2
SME405 -6	2	2	-	-	-	-	-	3	1	3	3	3

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF405-1 Draw brix curves &write interpretation of brix curve.			
1	**MILLING CONTROL** 1.1 Definitions of various terminologies used In milling controls. Cane, Bagasse, Brix, Brix free cane water, Fibre, Imbibition, Absolute Juice, First expressed juice, last expressed juice, last mill juice, primary juice, mixed juice, clarified juice, secondary juice etc. **BRIX CURVE** 1.2 Determination of preparatory index. 1.3 Plotting Bix curves. 1.3 Interpretation of Brix curves.	**05**	**10**
Course Outcomes SMF405-2 Solve problems on Mill Extraction & calculate pol in cane.			
2	**EXTRACTION AND PERFORMANCE** 2.1 Extraction of juices, primary extraction, secondary extraction, mixed juice % cane, Added water % cane, Bagasse % cane. 2.2 Pol in cane, mill extraction, R.M.E. 2.3 Fibre % cane, Fibre % bagasse, Added water % Fibre. 2.4 Equivalent Ratio Quotient value(ERQV). 2.5 Comparairing the milling performance.	**06**	**20**
Course Outcomes SMF405-3 Explain the concept of Rapi Pol Extractor &calculate pol % &Recovery.			
3	**RECOVERY AND POL** 3.1 Rapi pol extractor for fiber % cane direct & indirect methods. 3.2 Pol % determination by Rapi pol extractor,. 3.3Expected recovery by lab Crusher Method.	**05**	**10**
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	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF405-4 Calculate available sugar &molasses from massecuite &molasses.			
4	**BOILING HOUSE CONTROL** 4.1 Basic definitions in boiling house. Syrup, Condensate, Magma, Massecuit, molasses, Normal Sugar Solution, Seed, Mother liquor, Commercial Sugar, Sugar standard Granulated, Equivalent slandered Granulated etc. **STOCK TAKING AND POL BALANCE.** 4.2 Importance of stock taking. 4.3 Pol balance. 4.4 Calculating available Sugar & available molasses from massecuite, Molasses, Syrup, Clear Juice.	**05**	**14**
Course Outcomes SMF405-5 Apply basic formulae to calculate BHR, RBHR, Actual & Theoretical molasses.			
5	**FORMULAE AND CALCULATIONS** 5.1S.J.M. formulae. 5.2Boiling house recovery, Reduced boiling house recovery by Gundurao's & Noel Deer formulae, Overall recovery. 5.3Clarification factor, Clarification efficiency. 5.4Actual finale molasses % theoretical final molasses. 5.5 Basic BHR, Recorded BHR. 5.6Brix free cane water.	**05**	**14**
Course Outcomes SMF405-6 Explain the role of Chemist & contents of different reports generated.			
6	**REPORTS** 6.1Daily manufacturing report. 6.2 RT7(C), RT8(C), Run report & other reports required for Excise purpose. 6.3Duty of Lab. Incharge, Manufacturing chemist. Chief Chemist	**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.			

Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of Topic	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	MILLING CONTROL	SMF405-1	02	-	02	**04**
	BRIX CURVE	SMF405-1	02	02	02	**06**
I / 2	EXTRACTION AND PERFORMANCE	SMF405-2	04	06	10	**20**
I / 3	RECOVERY AND POL	SMF405-3	02	04	04	**10**
II / 4	BOILING HOUSE CONTROL	SMF405-4	02	02	-	**04**
	STOCK TAKING & POL BALANCE.	SMF405-4	02	02	06	**10**
II / 5	FORMULAE AND CALCULATIONS	SMF405-5	02	04	08	**14**
II / 6	REPORTS	SMF405-6	02	06	04	**12**
			18	26	36	**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.

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
1	To determine Preparation Index	SMF405-1	Use different formulae to calculate efficiency figures to control process in milling & boiling house. Work out efficiency of Preparatory Equipments. Observation, Data collection, Graphical & Representation. Comparing and Interpretation of control and efficiency figures of different factories.
2	Plot brix Curve& write the interpretation for the same.	SMF405-1	
3	To study M.E. and R.M..E.	SMF405-2	
4	To study BHR, RBHR and ESG factor	SMF405-2	
5	To study expected recovery and expected molasses.	SMF405-3	
6	To study pol balance	SMF405-4	
7	To study stock taking method	SMF405-4	
8	To study different formulae used in control system	SMF405-5	
9	To study Mixed Juice % cane & Bagasse % cane	SMF405-5	
10	Determine pol% bagasse by Rapi Pol extractor .	SMF405-1	

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.
4. Factory Visits.

Teaching and Learning Resources, including References of Books:

1. Chalk & Black-Board
2. O.H.P.
3. Slides
4. Video Films.
5. Books:
   1) Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
   2) Introduction to Cane Sugar Technology -By Jenkins.
   3) Handbook of Cane Sugar Technology -By Spencer & Meade.

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
	Total	25

Assessment for Semester End Practical Exam as per Pro-forma II.

COURSE ID:

Course Name : CAPACITY DESIGN AND CALCULATION
Course Code : SMF 406
Course Abbreviation : FCDC

TEACHING AND EVALUATION SCHEME:

Pre-requisites: Nil

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	04	06
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		
	Theory	Practical	Theory	PR*	Term Work
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	PR	T W
Marks	20 each	--	80	25*	25

* Assessment as per Pro-forma IV and VI.

Rationale:

Sugar Engineers have vital role in human life. Today's fast lifestyle of human is complimented in great Sugar Production Manager have to work with various power producing & power absorbing devices like Mills, Boilers, Turbines, Compressors, Pumps etc. In order to apply the knowledge of principles concept of energy, work, heat & conversion between them in line with these devices, it is important to study and understand the Mill Capacity Calculation, Heat and Steam Balance Calculation in Sugar Industry.

This Course is dealt with the Power requirement, Water and Steam requirement for process, energy efficiency and other engineering aspects essential for a Sugar Production Manager. It also includes the study of various sources of energy, Power Plants to enhance the knowledge with respect to the new emerging concept of Co-generation Plant.

COMPETENCY: Apply knowledge of principles & formulae's to calculate capacity of equipment in sugar industry

Cognitive: Understand and apply principle to calculate capacity of equipments.

Psychomotor: Able to design equipments.

Affective: Attitude of 1) precision 2) accuracy 3) Safety 4) punctually 5) aesthetic presentation.

COURSE OUTCOMES:

SMF406-1 Calculate area ,cane & water required & calculate cap of juice heater, slaker, burner.

SMF406-2 Calculate capacity of cane carrier. Classify factors influencing milling work.

SMF406-**3** Calculate mill capacity ,pump capacity, classify rollers.

SMF406-**4** Design juice heater calculate capacity of clarifier & Rotatory drum filter.

SMF406-**5** Calculate H. S. of Multiple Effect Evaporator, Design Vapor cell assembly.

SMF406-**6** Calculate plan and centrifugal capacity.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	3	1	2	-	-	-	1	1	1	3	2
SMF406-1	2	3	1	2	-	-	-	1	1	1	3	2
SMF406-2	2	3	1	2	-	-	-	1	1	1	2	2
SMF406-3	2	3	1	2	-	-	-	1	1	1	3	2
SMF406-4	2	3	1	2	-	-	-	1	1	1	3	2
SMF406-5	2	3	1	2	-	-	-	1	1	1	3	2
SMF406-6	2	3	1	2	-	-	-	1	1	1	3	2

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF406-**1** Calculate area ,cane & water required & calculate cap of juice heater, slaker, burner.			
1	**1.1 General:** Selection of site for a sugar factory, types of layout, requirement of cane area, water requirement. **Juice Weighing, Lime and Sulphur Requirement:** 1.2 Capacity of Juice and Imbibitions water weighing scale. 1.3 Capacity of Lime slacker. 1.4 Capacity of Milk of lime storage tank. 1.5 Capacity of Sulphur burner.	12	16
Course Outcomes SMF406-**2** Calculate capacity of cane carrier. Classify factors influencing milling work			
2	**Milling** : 2.1Design Features of Cane Fibrizer. 2.2Cane Carrier Capacity of width, length and depth, Power required for preparatory devices. 2.3 Factors Influencing Milling Work :Crushing, Degree of compression, Mill construction & operation, Roller grooving. 2.4Feeding Devices, Speed of roller, Nature of Feed, Thicness of bagasse layer. 2.5 Drainage of juice, Trash plate setting, Density of compressed bagasse, Hydraulic Pressure.	10	12
Course Outcomes SMF406-**3** Calculate mill capacity ,pump capacity, classify rollers			
3	**Mill Capacity:** 3.1Design Features of Mill roller, Shaft and Shell. 3.2 Factors affecting capacity of mills. 3.3 Fibre in Cane, Roller dimension and speed, Number of rollers, 3.4Capacity formula for Mill. 3.4 Capacity of juice transfer pumps. 3.5 Power Required for mill, Raw juice and Imbibitions water pump capacities,	10	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	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF406-**4** Design juice heater calculate capacity of clarifier & Rotatory drum filter.			
4	**Juice Heating, Settling and Filtration Capacity:** 4.1 Design parameters & Capacity of Juice Heater. 4.2 Calculations for Number of tubes, passes, heating surface of juice heater. 4.3 Design feature and Capacity of batch and continuous Clarifier. 4.4 Design feature and Capacity of Rotary drum vacuum filter.	**06**	**10**
Course Outcomes SMF406-**5** Calculate H. S. of Multiple Effect Evaporator, Design Vapor cell assembly.			
5	**Juice Evaporation Capacity** : 5.1 Design of Vapor Cell Assembly. 5.2 Calculation of heating surface of multiple effect evaporators. 5.3 Calculation of specific evaporation coefficient. 5.4 Diameter of vapor inlet & outlet.	**10**	**12**
Course Outcomes SMF406-**6** Calculate plan and centrifugal capacity.			
6	**Pan and Crystalliser Capacity:** **6.1** Factor affecting Design and Performance of Vacuum Pan, Consideration in Pan Design,. 6.2 Design of Vacuum Pan. 6.3 Pan Capacity by massecuite %cane method. 6.4 Calculation for Heating Surface of calindria Pan. 6.5 Capacity of crystallizers, **Centrifugation Capacity** 6.6 Capacity of Centrifugal Machines. 6.7 Factor affecting working Capacity of centrifugal machine. 6.8 Mechanical consideration for centrifugal machine. **Hopper and Grader:** 6.9 Capacity of hopper, grader.	**16**	**18**
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	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	**General**	SMF406-1	02	00	04	06
	Juice Weighing, Lime and Sulphur Requirement	SMF406-1	02	02	06	10
I / 2	**Milling**	SMF406-2	04	04	04	12
I / 3	**Mill Capacity**	SMF406-3	--	04	08	12
II / 4	**Juice Heating, Settling and Filtration Capacity:**	SMF406-4	--	04	06	10
II / 5	**Juice Evaporation Capacity**	SMF406-5	--	06	06	12
II / 6	**Pan and Crystalliser Capacity**	SMF406-6	02	04	06	12
	Centrifugation Capacity	SMF406-6	02	04	00	06
			12	28	40	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.

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
01	To Study the Mill house construction. (Drawing of Roller Shaft, Hydraulic Cap, Accumulator)	SMF406-2	To identify and understand the function of roller, Hydraulic cap, Accumulator.
02	To Study the Cane Carrier construction.	SMF406-2	To observe and understand the function & arrangement of various Cane Carrier.
03	To Study design feature of juice heater(Entire body, tube plate & arrangement ,compartment showing tubes per pass, Inlet –out let).	SMF406-4	To develop ability to analyze tubes per pass.
04	To Study design feature of Catchall for pan (Helmet type)	SMF406-6	To develop ability to analyze the performance of Catchall for pan Units in Sugar Industry.
05	To Study design feature of Catchall for Evaporator	SMF406-5	To develop ability to analyze the performance of of Catchall for Evaporator Sugar Industry.
06	To Study design feature of Batch type vacuum pan.	SMF406-6	To develop ability to analyze the performance of Batch type vacuum pan.
07	To Study design feature of Proportioning of evaporator.	SMF406-5	To understand practically working of the above air and steam consuming units along with their Maintenance

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	30
		50

Instructional strategies:

1) Lectures and discussions.
2) Laboratory experiences and laboratory interactive sessions.
3) Time bound assignments.

Teaching and Learning resources, including references:

1) Chalk-board.
2) Demonstrative kits.
3) Demonstrative charts.
4) Books:
    - Heat engine vol II & III by Patil & Karamchandani.
    - Heat engine by Kumar Vasandani.
    - IC engine by Mathur Sharma.
    - IC engine by Ganeshan.

Criteria for assessment at semester end practical exam:

Sr. no	Criteria	Marks allotted
1	Correct figures / diagrams	20
2	calculations	05
	Total	25

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

COURSE ID:

Course Name : COMPUTER APPLICATIONS
Course Code : SMF 407
Course Abbreviation : FCOA

TEACHING AND EVALUATION SCHEME:

Pre-requisites: NA

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	00	04
Practical	04	

Evaluation Scheme:

Component	Progressive Assessment		Semester end	
	Theory	Practical	TW*	PR
Duration	Two tests (1hour each)	One practical (2hours)	Journal	practical
Marks	NA	NA	25	25

* Assessment as per Pro-forma III.

Rationale:

Information Technology has been a major area of innovation in recent years which results in computerized processes in most of the Industries. This is due to the growth of computers and computer aided systems of information processing and retrieval. The impact of these developments on business management is reflected in growing demand for computer professionals with a sound understanding of basic computer applications in Industry covering data base management, application of computer software in specific and other communication systems.

Keeping this in mind this Course is aims to introduce the students to some effective tools to enable them to enhance their knowledge and foster creativity, to learn to process words and numbers, communicate ideas effectively and make the optimum use of computer resources. This compulsory subject will ensure the students to have proficiency in handling different types of software generally used in Sugar Industries, to prepare to work accordingly and to keep abreast of recent developments in Computer Applications essential / useful in Sugar Industry

COMPETENCY:
Applying sound knowledge of computer application in S.I. as follows:

Cognitive: Understand and applying basic knowledge of computer application for data management in S.I.
Psychomotor: i) Calculating skills ii) Operating skills iii) Management skills
Affective: Attitude of i) Precision ii) Accuracy iii) Safety iv) Punctuality.

COURSE OUTCOMES:

SMF407-1 Use of MS Word & MS Power point for documentation & presentation.
SMF407-2 Prepare documents through spread sheet in MS Excel.
SMF407-3 Understand the information storage & retrieval in MS Access.
SMF407-4 Analyze the commercial & business application of computer.
SMF407-5 Creation & use of e-mail account.
SMF407-6 Understand various application of internet for studying 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 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying sound knowledge of computer application in S.I.	2	1	2	1	--	--	--	--	1	1	2	1
SMF407-1 Use of MS Word & MS Power point for documentation & presentation.	2	1	1	1	--	--	--	--	1	1	2	1
SMF407-2 Prepare documents through spread sheet in MS Excel.	2	1	1	1	--	--	--	--	1	1	2	1
SMF407-3 Understand the information storage & retrieval in MS Access.	2	1	2	1	--	--	--	--	1	1	2	2
SMF407-4 Analyze the commercial & business application of computer.	2	1	1	1	--	--	--	--	1	1	1	2
SMF407-5 Creation & use of e-mail account.	1	1	1	1	--	--	--	--	1	1	1	1
SMF407-6 Understand various application of internet for studying purpose.	2	1	2	1	--	--	--	--	1	2	1	1

S.N.	Topics Subtopics	Practical (Hours)
Course Outcomes SMF407-1 Use of MS Word & MS Power point for documentation & presentation.		
1.	**USING MS OFFICE** **Preparation of Documents Through Word Processing , Power Point Presentation, Spread Sheet and Data Base File** **Word Basics**: Starting Word, Creating Documents, Opening a document, Inserting Objects,(Tables, Chart, Picture), Editing document Parts of Word Window, Some 'Don'ts', Formatting Features, Menus, Commands, Toolbars and their Icons, Character, word and Line Editing, Margin Setting, Paragraph alignment, Block Operations, Spell Checker, Saving a document. **Power Point Basics**: Introduction, Toolbars, Their Icons and Commands, Navigating in Power Point, Performs Sample Exercises, Slide Show with integration of multimedia and other features, Performs Sample PPT Exercises for a given Theme.	**04** **08**
Course Outcomes SMF407-2 Prepare documents through spread sheet in MS Excel.		
2.	**Excel Basics**: Introduction, Menus, Commands, Toolbars and Their Icons, Information Presentation For Decision Making Using Spread Sheet, Applications of spread sheet, Structure of spread sheet, Preparing spread sheet for simple data and numeric operations, Using formulae in spread sheet operations, Making Tables, sorting and querying, Creation of graphs, Pie charts, bar charts.	**10**
Course Outcomes SMF407-3 Understand the information storage & retrieval in MS Access.		
3.	**MS Access**: Introduction, Need for information storage and retrieval, Parts of an Access Window, Tool Bars and Their Icons, Starting Microsoft Access, Creating a New Database, Creating a Database through Table Wizard **,** Creating a New Table, Rename Columns, Saving the Database, Creating Table through Design View, Query, Forms, Reports.	**10**

S.N.	Topics Subtopics	Practical (Hours)
Course Outcomes SMF407-4 Analyze the commercial & business application of computer.		
4.	**COMPUTER APPLICATION OVER VIEW** **Commercial and business Application**: CAD, CAM, CAI, Use of computers for measurement and control, Overview of a computer based control system, Make use of available Soft ware used in Sugar Industry. **Computer aided Drafting (CAD),** Make simple drawings by using features of CAD and confirming the drafting specifications, Saving and retrieving drawings, Dimensioning, Lettering, Plotted drawing etc,	08 08
Course Outcomes SMF407-5 Creation & use of e-mail account.		
	Internet and Surfing: **Creation of New Email Account**: Create your own Email account, Set the account preferences while registration. Create your signature in e-mail account. **Email with File Attachment**: Sending an email with sample image file attachment from your e-mail account, Receive this email and confirm signature appended with it. **Outlook Express Exercise**: Add your email account in 'Outlook Express' and explore the settings. Create your signature in 'Outlook Express' with details.	04 04 04
Course Outcomes SMF407-6 Understand various application of internet for studying purpose.		
	Activities to be perform on Internet useful to the Students in future: Browse Institute website http://wwww.gpkolhapur.org.in Browse active topic available on the web site.(Result, Registration, Convocation, Contest, Paper Presentation, Feed Back etc), Registered yourself on web site as a ALUMNI, Browsing web site www.msbte.com, www.dte.org.in, with a view to prepare for Online activities required for higher studies or bright prospects, Interaction through Online Counseling Forum by posting few questions/queries, Post reply to already posted articles/questions/queries on any one of the forums.	04
Students have to submit a Report / Assignment in the form of Journal **and** Perform 'Practical Activity' and face Viva-voce at the end of Term on the above Topics.		

Laboratory Experiences

A Journal shall consist of a record in the form of list of activities, printouts and necessary documentation for the following exercises. Students are expected to perform all activities and get the Journal certified from the Concerned Faculty/Practical Lab Instructor.

Laboratory Experiences and related Skills Development.

Sr. No.	Laboratory Experience	CO	Skills developed
1	**USING MS OFFICE** Preparation of Documents Through Word Processing, Power Point Presentation, Spread Sheet and Data Base File.	SMF407-1 SMF407-2 SMF407-3	**MS Word**: Starting Word, Creating Documents, Opening a document, Inserting Objects,(Tables, Chart, Picture), Editing document Parts of Word Window, Formatting Features, Using Commands, Toolbars and their Icons, Character, word and Line Editing, Margin Setting, Paragraph alignment, Block Operations, Spell Checker, Saving a document. **Power Point** : Using Toolbars, Their Icons and Commands, Navigating, Preparing and rendering Slide Show with integration of multimedia and other features, **Excel** :Understanding Menus, Commands, Toolbars, Icons, Applications of spread sheet, Structure of spread sheet, Preparing spread sheet for simple data and numeric operations, Using formulae in spread sheet operations, Making Tables, sorting and querying, Creation of graphs, Pie charts, bar charts. **MS Access:** : Understanding concept of Information Storage and retrieval, Need for information storage and retrieval, Parts of an Access Window, Tool Bars and Icons, Starting Microsoft Access, Creating a New Database, Creating a Database through Table Wizard **,** Creating a New Table, Rename Columns, Saving the Database, Creating Table through Design View, Relationship, Making Query on single and multiple keys , Printing Forms and Reports
2	**COMPUTER APPLICATION OVER VIEW**	SMF407-4 SMF407-5 SMF407-6	Understanding Commercial and business Application of Computer, CAD, CAM, CAI, Use of computers for measurement and control, Knowing a computer based control system, Making use of available Soft ware used in Sugar Industry. Making drawings by using features of CAD and confirming the drafting specifications, Saving and retrieving drawings. Creating New Email Account, Sending and receiving

			e-mail, Sending an email with sample image file attachment, Understanding the application of Outlook Express**,** Adding email account in 'Outlook Express' and exploring the settings. Surfing Net, Browsing the websites, Understanding the skill of Interacting through Social Net Working Web Sites.

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

Sr. No.	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	5
3	Correct figures / diagrams	3
4	Observation tables	2
5	Result table / calculations / graphs	5
6	Safety / use of proper tools	5
		25

Instructional strategies:

4) Lectures and discussions.
5) Laboratory experiences and laboratory interactive sessions.
6) Time bound assignments.

Teaching and Learning resources, including references:

5) Chalk-board.
6) Demonstrative kits.
7) Demonstrative charts.

Books:

SN	Author	Title	Publication
01	P.N. Rao	CAD/CAM Principles and Applications	Tata McGraw-Hill
02	RadhaKrishna P. & Subramanyam	CAD/CAM/CIM	Wiley Eastern Ltd.
03	MS- Office	Easy Guide.	BPB Publications.
04	A Text Book Of Computer Application	Easy Guide.	BPB Publications.

Criteria for assessment at semester end practical exam:

Sr. No.	Criteria	Marks allotted
1	Correct figures / diagrams	10
2	Observation tables	5
3	Result table / calculations / graphs	5
4	Safety / use of proper tools / workmanship	5
	Total	25

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

COURSE ID:
Course Name : SUGAR FACTORY MAINTENANCE
Course Code : SMF 408
Course Abbreviation : FSFM

TEACHING AND EVALUATION SCHEME:
Pre-requisites: None.
Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	2	6
Practical	4	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL*	T W	
Marks	20	--	80	25	25	150

Assessment as per Pro-forma IV and VI.

Rationale:

Sugar Factory maintenance is very critical issue to ensure quality and quantity of production. All the equipments must be maintained in the approved manner while operating, during scheduled and annual shut down so as to perform the operation appropriately & efficiently. Industries are not able to survive and progress if proper maintenance of equipment is not done. In the absence of proper maintenance, industries are busy in every day fire fighting to repair the breakdowns and manage production in very unsafe manner, hence it is very essential to understand the importance of preventive maintenance w r to smooth operation of Sugar Industry.

This course is basically dealt with the maintenance of different equipments involved in Sugar Manufacturing process at various stations. Studies of the major and most of the equipments with basic knowledge and skills regarding maintenance problems, their causes and remedies involved in Sugar Manufacturing process are included in this course.

COMPETENCY: Apply the knowledge and skill regarding maintenance, their causes & remedies as follows:
Cognitive: 1) Understand the concept, importance, function &responsibility of maintenance department.
2) Identify the causes & remedies of breakdown of equipments.
Psychomotor: Operating skill, Trouble shouting skill.
Affective: Attitude of 1) precision 2) accuracy 3) Safety.

COURSE OUTCOMES:

SMF408-1.Explain the concept of effective & preventive maintenance, Function & responsibility of maintenance dept.

SMF408-2 Select proper lubricants for sugar machinery.

SMF408-3 Develop ability of comprehending the origin of mill stoppages.

SMF408-4 Able to demonstrate seasonal maintenance of boiling house equipments.

SMF408-5 Apply knowledge for varies trouble scooting of pan station.

SMF408-6 Explain the maintenance of centrifugal 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 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Organize	PSO2 Production & Management
Competency	2	3	-	2	-	-	1	3	3	3	3	3
SMF408 -1	2	2	-	-	-	-	1	1	2	3	2	2
SMF408 -2	2	2	-	1	-	-	1	2	2	2	2	2
SMF408 -3	3	3	-	2	-	-	1	3	2	3	3	2
SMF408 -4	3	3	-	2	-	-	1	3	3	3	3	3
SMF408 -5	3	3	-	2	-	-	1	3	3	3	3	3
SMF408 -6	3	3	-	2	-	-	1	3	3	3	2	3

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF408-1.Explain the concept of effective &preventive maintenance, Function &responsibility of maintenance dept.			
1	**EQUIPMENTS MAINTENANCE** 1.1 Concept and importance of effective maintenance. 1.2 Elements common to effective maintenance Program 1.3 Factors affecting Off-season and seasonal maintenance of Sugar Factory. 1.4 Causes of breakdown and stoppages.	**03**	**08**
	PREVENTIVE MAINTENANCE 1.5 Function, Responsibility and Scope of Maintenance Department,. 1.6 Concept and Need of Preventive Maintenance. 1.7 Organizational set-up and Preventive Maintenance Schedule. 1.8 Application and Procedure of Preventive Maintenance in Sugar Industry. 1.9Example of Equipment Card, Equipment History Card, Job Card, etc.	**04**	**10**
Course Outcomes SMF408-2 Select proper lubricants for sugar machinery.			
2	**LUBRICATION** 2.1 Need and Importance of Lubrication. 2.2 Instruction on Lubrication. 2.3 Correct Lubrication as a tool for Preventive Maintenance. 2.4 General Hints Regarding Lubrication, Lubrication in Sugar Industry, 2.5 Methods of Lubrication. 2.6 Lubrication of Open Gearing, Steam Engine and Turbine.	**04**	**10**
Course Outcomes SMF408-3 Develop ability of comprehending the origin of mill stoppages.			
3	**MILL HOUSE MAINTENANCE** 3.1 Maintenance and Overhauling of : Cane handling Equipments, cane feed table, , Mechanical Cranes, Cane Carrier, Cane Cutter, Inter mediate carrier, Turbine, Safety Recommendations. 3.2 Mill Efficiency Factors. 3.3 Maintenance during shutdown. 3.4 Causes of failure of Machinery, Steps to control the failures. 3.5 Normal problems of Mills. 3.6 Special problems of Mills. 3.7 Operating problems of Mills,	**05**	**12**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course Outcomes SMF408-4 Able to demonstrate seasonal maintenance of boiling house equipments.			
4	**BOILING HOUSE MAINTENANCE** 4.1 Periodical and Annual Maintenance of following Boiling House Equipments: Juice Heater, Reaction Tank, Lime Slacker, SO2 generation Unit, Clarifier etc. 4.2 Precaution to be taken during Maintenance. 4.3 Maintenance of Pumps and Valves used in Sugar Industry, Pump Trouble Shooting, (Trouble and Symptoms/Cause),	**04**	**12**
	EVAPORATOR 4.4 Cleaning and Testing of Evaporator. 4.5 Method of Removal of Scale. 4.6 Precaution to be taken during cleaning. 4.7 Chemical and Mechanical Cleaning. 4.8 Precautions and Maintenance during Scheduled and Annual shut Down	**04**	**08**
Course Outcomes SMF408-5 Apply knowledge for varies trouble scooting of pan station.			
5	**VACUUM PANS AND CRYSTALLIZERS** 5.1 Variopus Mechanical Trouble Shooting at Pan Station, Vacuum Trouble. 5.2 Regular Overhauling and repairs. 5.3 Testing, Maintenance during Season. 5.4 Periodical Cleaning and Annual maintenance Schedule. 5.5Testing and Checking of Crystallizer,Usual Problems andSolution. 5.6Maintenance of crystallizers, Pug Mills, Transient Heaters.	**05**	**12**

Course Outcomes SMF408-6 Explain the maintenance of centrifugal machines.			
6	**CENTRFUGAL MACHINES** 6.1 Maintenance of Centrifugal machine. 6.2 Fault Diagnostics and Trouble Shooting in both Batch type and Continuous type Machine. 6.3 Checking Testing and Operation of Air Compressor. 6.4 How to avoid Break-down of Air Compressor. 6.5 Maintenance guide lines for Grass hopper, Elevator, Sugar Grader, Dust catcher.	**03**	**08**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Specification table for setting question paper for semester end theory Examination

Section / Topic no.	Name of Topic	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	EQUIPMENTS MAINTENANCE	SMF408-1	02	02	04	**08**
	PREVENTIVE MAINTENANCE	SMF408-1	02	04	04	**10**
I / 2	LUBRICATION	SMF408-2	02	04	04	**10**
I / 3	MILL HOUSE EQUIPMENT	SMF408-3	02	04	06	**12**
II / 4	BOILING HOUSE MAINTENANCE	SMF408-4	02	04	06	**12**
	EVAPORATOR	SMF408-4	02	02	04	**08**
II / 5	VACUUM PANS AND CRYSTALLIZERS	SMF408-5	02	04	06	**12**
II / 6	CENTRFUGAL MACHINES	SMF408-6	02	02	04	**08**
			16	26	38	**80**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.						

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
1	To study the following causes of Mill Stoppages In Sugar Plant due to • No Cane • Mechanical. • Electrical • House jamming • Rain	SMF408-1	• ToAppreciate the need of maintenance in Industry • To describe functions of maintenance department • To develop ability of comprehending the origin of mill stoppages during crushing season process. • To understand the concept of preventive maintenance in Sugar Industry. • To understand & observe Lubricating System. • To observe & understand seasonal & off seasonal maintenance of various equipments involved in sugar manufacturing process. .
2	To Study procedure of preventive maintenance in Sugar Industry.	SMF408-1	
3	To study Lubricating System in open gearing.	SMF408-2	
4	To study Lubricating System in Steam Turbine.	SMF408-2	
5	During factory visit study the procedure of seasonal & off seasonal maintenance of a) Cane Carrier b) Juice Heater c) Evaporator d) Clarifier e) Pan f) Crystallizer g) Centrifugal machine h) Sugar Hopper i) Sugar Grader.	SMF408-4 SMF408-5 SMF408-6	

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05
	TOTAL	**25**

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.
4. Factory Visits.

Teaching and Learning Resources, including References of Books:

1. Chalk & Black-Board
2. O.H.P.
3. Slides
4. Video Films.
5. Books:
    - Principles of Cane Sugar Technology -By Honig (Vol. I, II & III)
    - Introduction to Cane Sugar Technology -By Jenkins.
    - Handbook of Cane Sugar Technology -By Spencer & Meade.
    - Handbook of Cane Sugar Engineering -by E Hugot
    - Cane Sugar Engineering -by Peter rein

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
		25

Assessment for Semester End Practical Exam as per Pro-forma V and VI.

COURSE ID:

Course Name : INDUSTRIAL ENGINEERING
Course Code : SMF 409
Course Abbreviation : FINE

TEACHING AND EVALUATION SCHEME:
Pre-requisite Course(s) : Nil
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 Examination	Term Work	Oral Examination (Internal))	
Details of Evaluation	Average of two tests of 20 marks each	i.25 marks for each practical ii.One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma-IV	As per Proforma-VI	
Marks	**20**	**--**	**80**	**25**	**25**	**150**

Assessment as per Pro-forma IV and VI.

RATIONALE:

This subject is technology subject. A Technician is required to work at the highest Productivity level. His productivity is dependent on the productivity of the machines and the people in the manufacturing system. Hence he should learn the techniques for improvement in productivity of the people and equipment. A technician required to plan the production schedule accordingly organize material supply for the manufacturing activities. The total cost of goods produced contains large portion of overhead cost. Technician is required to minimize the direct and indirect cost by optimizing the use of resources available to him. Hence he should learn accounting process, inventory control and process planning. Modern manufacturing system employ techniques such as JIT, TPM, FMS, 5'S', kaizen which should be known to the technician

COMPETENCY: Apply techniques for improvementin productivity of the people &equipment.

Cognitive: To plan the production schedule accordingly organize material supply for the manufacturing activity.
Psychomotor: Increase productivity.
Affective: 1) precision 2) accuracy 3) Safety 4) Punctuality.

COURSE OUTCOMES:

SMF409-1. Know different production system and modern trends in manufacturing system.

SMF409-2. Understand process planning.

SMF409-3. Explain production planning and control.

SMF409-4. Explain work study.

SMF409-5. Understand inventory control jigs and fixtures.

SMF409-6. Understand manufacturing systems, waste reduction inventory reduction flexible manufacturing 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 Basic knowledge	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	2	-	-	-	-	-	2	2	1	2	2
SMF409-1	2	2	-	-	-	-	-	2	2	1	2	2
SMF409-2	2	2	-	-	-	-	-	2	2	2	2	2
SMF409-3	2	2	-	-	-	-	-	2	2	1	2	2
SMF409-4	2	2	-	-	-	-	-	2	2	1	2	2
SMF409-5	2	2	-	-	-	-	-	2	1	2	2	2
SMF409-6	2	2	-	-	-	-	-	2-	1	1	2	2

CONTENT :

A. THEORY : SECTION -I

Sr. No.	Topics	Lectures (Hours)	Theory evaluation Marks
Course Outcome SMF409-1. Know different production system and modern trends in manufacturing system.			
1.	**Production System** 1.1 Production - Definition , Types of production systems 1.2 Productivity - Importance , Measurement of Productivity , 1.3 Techniques of improving productivity 1.4 Elements of cost- Fixed cost, Variable Cost. 1.5 Break even analysis, Calculation of Breakeven point.	**02**	**06**
	Plant location, Plant layout and Material Handling 1.6Plant Location - Importance of Site Selection, Factors affecting Site Selection , Government Policies , relaxation for Backward Areas. 1.7Plant Layout - Objectives, types, design principles, characteristics of Plant Layout, Symptoms of Bad Plant Layout. 1.8 Group technology , Cellular layout, 1.9 Material handling – Need, Principles and Types of material handling devices – conveyors , Hoist & cranes , forklift truck,trolleys, Pipes, Automated Guided Vehicles (AGV's) Selection of Material Handling systems and Devices.	**06**	**14**
Course Outcome SMF409-2. Understand process planning.			
2.	**Process Planning** 2.1 Planning of Processes from raw material to finished product, Factors affecting Process Planning, 2.2 Deciding sequence of operations, Operation Sheet, Combined operations, Determination of Inspection Stages. 2.3 Selection of Machine 2.4 Techniques of assembly planning, Types of assembly. 2.5 Plant Capacity, Machine Capacity,Plant Efficiency. Numerical not to be asked.	**06**	**10**
Course Outcome SMF409-3. Explain production planning and control.			
3.	**Production Planning and Control** 3.1Routing, Sequencing [n job 2 machines], 3.2 Scheduling, Dispatching, 3.3 Meaning of Control, Progressive Control, Gantt chart. Concept of Line balancing,	**02**	**10**
	Total	**16**	**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.			

SECTION II

Sr. No.	Topics	Lectures (Hours)	Theory evaluation Marks
Course Outcome SMF409-4. Explain work study.			
4	**Work Study** 4.1 Method Study- Objectives, Procedure, Selection of work. 4.2 Recording Techniques Process Charts ,Outline process chart, Flow process chart, Two Hand process chart, Multiple activity chart, Flow diagram, String diagram, Travel chart. 4.3 Micro motion study-Critical Examination, Principles of Motion Economy. 4.4 Concept of ergonomics and workplace layout. 4.5 Work Measurement -Objectives, procedure, Time Study, Time Study Equipments. Stop Watch Time Study, Standard Time, Work Sampling, Analytical Estimating, Predetermined Motion Time Study, Allowances, Calculation of Standard Time, Concept of Merit Rating.	**06**	**16**
Course Outcome SMF409-5. Understand inventory control, jigs and fixtures.			
5.	**Inventory Control** 5.1 Methods of Inventory Management, Inventory Cost relationship, 5.2 Deciding Economic Batch Quantity, EOQ Model, Calculation of 5.3 EOQ, Concepts of discounts. 5.4 Introduction of Material Requirement Planning, Stores Function – Storage systems – One bin , Two bin System, Material issue request (MIR), bin card.	**02**	**08**
	Jigs and Fixtures 5.5 Introduction. Difference between jig and fixture. 5.6 Different components of Jig/ fixture. 5.7 Principle of location. Types of locators and clamping devices. 5.8 General principles of jig/fixture design.Types of jigs and fixtures.	**02**	**06**
Course Outcome SMF409-6. Understand manufacturing systems, waste reduction,inventory reduction flexible manufacturing system.			

	manufacturing systems, 6.2 Waste reduction, 5'S', inventory reduction, single piece Production systems. Concept of continuous improvement (Kaizen) – DMIAC cycle, 6.3 Brain storming.Poka Yoke.Concept of Rapid Prototyping Concept of Flexible manufacturing system		
	Total	**16**	**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.			

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

Topic No.	Name of topic	CO	Distribution of marks (level wise)			Total marks
			Remember	Understand	Application	
I /1	**Production System**	SMF409-1	02	02	02	06
	Plant location, Plant layout and Material Handling	SMF409-1	04	06	04	14
I/2	**Process Planning**	SMF409-1	04	02	02	10
I/3	**Production Planning and Control**	SMF409-1	04	04	02	10
II/4	**Work Study**	SMF409-1	08	04	04	16
II/5	**Inventory Control**	SMF409-1	02	04	04	08
	Jigs and Fixtures	SMF409-1	02	02	02	06
II/6	**Modern Trends**	SMF409-1	04	04	02	10
			30	28	22	80

A. TERM WORK

Practical Exercises and related skills to be developed :

Sr. No	Title of Practical Exercise	CO	Skills / Competencies to be developed
1	To prepare a Plant Layout of a Small Scale Industry.(industrial visit)	SMF409-1	To understand functioning of various departments in a Small Scale Industry.
2	To prepare process planning sheet of a component.	SMF409-2	To understand and plan sequence of operations of given component.
3	To prepare Gantt Chart.	SMF409-3	To prepare Gantt Chart to minimize the movements of man, material and machine.
4	To prepare different process chart (any two)	SMF409-4	To optimize the operations and sequencing various operations using different process chart symbols.
5	Case study on Modern Trends.	SMF409-6	Awareness of latest techniques being used in the new management era.
6	To Prepare Jig for Simple component	SMF409-5	To understand functioning of various components of jig prepare drawing and list the component

C. INDUSTRIAL EXPOSURE :

SN	Mode of Exposure	Topic
1	Industrial Visits	**Plant location, Plant layout and Material Handling**

ASSESSMENT CRITERIA FOR TERM WORK :

Sr. No.	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Sequence of operations	05
3	Correct dimension	06
4	Overall finishing	05
5	Safety / use of proper tools	04
		25

ASSESSMENT CRITERIA FOR PRACTICAL EXAMINSTION :

Sr. No.	Criteria	Marks allotted
1	Preparation & procedure of component	05
2	Correct dimension	10
3	Overall finishing	05
4	Safety / use of proper tools / workmanship	05
	Total	25

INSTRUCTIONAL STRATEGIES :

Instructional Methods :

1) Lectures and discussions.
2) Industrial Visits interactive sessions.
3) Time bound assignments.

Teaching and Learning resources :

1) Chalk-board.
2) Demonstrative kits.
3) Demonstrative charts.
4) O.H.P

REFERENCE MATERIAL :

a) Books

Author	**Title**	**Publisher**
P.N.Rao	CAD/CAM Principles and	Applications
RadhaKrishna P. &	Subramanyam	CAD/CAM/CIM Wiley EasternLtd
B.S.Pabla and M.Adithan	CNC Machine	New age International(P)Ltd
Groover M.P. &	Zimmers Jr	Computer Aided design and
T R Banga S C Sharma	Industrial Engineering & Management	Khanna Puplishers
O.P.Khanna	Industrial Engineering	Khanna Puplishers
I.L.O	Introduction to work Study	Tata McGraw Hill

COURSE ID:

Course Name : PLANT MAINTENANCE ENGINEERING

Course Code : SMF 410

Course Abbreviation : FPME

TEACHING AND EVALUATION SCHEME:

Pre-requisites: None.

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	2	6
Practical	4	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL*	T W	
Marks	20	--	80	25	25	150

Assessment as per Pro-forma IV and VI.

Rationale:

In the any kind of process industry maintenance of equipment in industries is very critical issue to ensure quality and quantity of production. Knowledge of plant maintenance and safety is essential to prevent accidents and damages while working in plant. Maintenance of plant and machinery is one of the most important aspects of process industry.Industries are not able to survive and progress if proper maintenance of equipment is not done.

This course provides information about wear, corrosion, lubrication, preventive maintenance; decision tree to diagnose faults, important provisions of factory act, alignment of equipment etc. This course also provides basic knowledge and skills regarding maintenance problems, their causes and remedies in industries This subject deals with safe practices, various types of maintenance and their significance.

COMPETENCY: Apply knowledge and skill regarding maintenance problems their causes and remidies in industry.

Cognitive: 1) **Understand stepwise procedure for maintenance.**

Psychomotor: Able to handle plant maintenance.

Affective: 1) precision 2) accuracy 3) Safety 4) Punctuality.

COURSE OUTCOMES:

SMF410-1.Explain type of maintenance, application of tools.
SMF410-2.Understand wear corrosion and prevention.
SMF410-3.Detect fault of machinery used in sugar industry.
SMF410-4.Know periodic and preventive maintenance in off season of sugar industry.
SMF410-5 Understand importance of safety rules.
SMF410-6 Know installation, erection and commissioning of equipments in sugar industry.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	1	-	-	-	-	-	1	1	1	2	1
SMF410-1	1	1	-	-	-	-	-	1	1	1	2	1
SMF410-2	1	1	-	-	-	-	-	1	1	1	2	1
SMF410-3	2	1	-	-	-	-	-	1	1	1	2	1
SMF410-4	1	1	-	-	-	-	-	1	1	1	2	1
SMF410-5	1	1	-	-	-	-	-	1	1	1	2	1
SMF410-6	1	1	-	-	-	-	-	1	1	1	2	1

Section I

`Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
	Course outcome SMF410-1.Explain type of maintenance, application of tools.		
1	**Fundamentals of Maintenance Engineering:** 1.1 Definition and aim of maintenance engineering. 1.2 Primary and secondary functions and responsibility of maintenance department, Types of maintenance. 1.3 Types and applications of tools used for maintenance. 1.4 Maintenance cost & its relation with replacement economy, Service life of equipment.	**06**	**14**
	Course outcome SMF410-2.Understand wear corrosion and prevention.		
2	**Wear, Corrosion and Prevention:** 2.1 Wear- types, causes , effects, Wear reduction methods. 2.2 Lubricants-types and applications, Lubrication methods –General sketch, working and applications: Screw down grease cup, Pressure grease gun, Splash lubrication, Gravity lubrication, Wick feed lubrication, Side feed lubrication, Ring lubrication. 2.3 Definition, principle and factors affecting the corrosion, Types of corrosion , Corrosion prevention methods.	**04**	**12**
	Course outcome SMF410-3.Detect fault of machinery used in sugar industry.		
3	**Fault Tracing:** 3.1 Fault tracing-concept and importance. 3.2 Decision tree-concept, need and applications. 3.3 Sequence of fault finding activities, show as decision tree. 3.4 Draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipments like:Any one machine tool, Pump, Air compressor, Internal Combustion engine, Boiler, Electrical motors. 3.4 Types of faults in machine tools and their general causes.	**06**	**14**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
Course outcome SMF410-4.Know periodic and preventive maintenance in off season of sugar industry.			
4	**Periodic and Preventive Maintenance:** 4.1 Periodic inspection-concept and need, Degreasing, cleaning and repairing Schemes Overhauling of mechanical components. 4.2 Overhauling of electrical motor. 4.3 Common troubles and remedies of Electric motor, Repair complexities and its use, Definition, need, steps and advantages of preventive maintenance. 4.4 Steps/procedure for periodic and preventive maintenance of: i. Machine tools.ii. Pumps.iii. Air compressors.iv. Diesel generating (DG) sets. 4.5 Program and schedule of preventive maintenance of mechanical and electrical equipments. 4.6 Advantages of Preventive maintenance, Repair cycle-concept and importance.	**07**	**16**
Course outcome SMF410-5 Understand importance of safety rules.			
5	**Industrial safety**: 5.1 Accident - causes, types, results and control, Mechanical& Electrical hazards types, Causes & preventive steps & procedure. 5.2 Describe salient points of Factories act 1948.for health and safety-, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc. Safety colour codes. 5.3 Fire prevention and fire fighting, equipment and methods.	**04**	**10**
Course outcome SMF410-6 Know installation, erection and commissioning of equipments in sugar industry.			
6	**Recovery, Reconditioning and Retrofitting:** 6.1 Definition of recovery, reconditioning and retrofitting. 6.2 Methods of recovery and their applications. 6.3 Selection criteria of recovery methods, Reconditioning - process, features and advantages, Retrofitting - concept, need and applications Installation. 6.4 Erection and Commissioning of Equipments: Design and planning of foundation, Erection and commissioning of Equipment, Alignment and testing of equipment.	**05**	**14**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.			

Specification table for setting question paper for semester end theory Examination

Section / Topic no.	Name of Topic	CO	Distribution of marks (level wise)			Total Marks
			Remember	Understand	Application	
I / 1	**Fundamentals of Maintenance Engineering:**	SMF410-1	06	04	04	**14**
I / 2	Wear, Corrosion and Prevention:	SMF410-2	04	04	04	**12**
I / 3	Fault Tracing:	SMF410-3	06	04	04	**14**
II / 4	Periodic and Preventive Maintenance	SMF410-4	06	06	04	**16**
II / 5	Industrial safety:	SMF410-5	04	04	02	**10**
II / 6	Recovery, Reconditioning and Retrofitting:	SMF410-6	04	06	04	**14**
			30	28	22	**80**
While setting the Question Paper of Semester end examination, the questions to be set on each topic should be of 1.5 times of the marks allotted to the corresponding Topic.						

Practical Exercises and related skills to be developed :

Sr no	Laboratory experience	CO	Skills developed
1	To Study and demonstrate use of various types of tools. (Fix spanners, box spanners, ring spanners, allen keys, types of pliers, screw drivers, bearing puller, etc.).	SMF410-1	Laboratory exercises and Practicals: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of Course Outcomes related to affective domain.
2	Measurement of Wear:Measure wears of anyone of the following. a. Machine guide ways., b. Shaft –sleeve., c. Piston –cylinder., d. Bearing	SMF410-1	
3	Corrosion: Each student will collect corroded component from field and identify the types of corrosion and possible causes. Student will also suggest prevention methods.	SMF410-2	
4	Fault Tracing and Decision Tree:To develop decision tree for location of fault for any two items from following: Boiler, IC Engines, Pump, Air Compressor, Electric Motor	SMF410-3	
5	Maintenance of Mechanical Based Equipment/Device/Machine: Maintenance of any two from following. Batch may be divided in to two groups and each group may be given one case. a. Head stock. b. Tail stock.c. Feed box.d. Indexing head.g. Internal combustion (IC) engine. h. Pump.(Dismantle of given case, observe rules, follow sequence of dismantling operations, cleaning, inspection, measuring deviations , recovery methods, testing and assembling).	SMF410-4	Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.
6	Preventive Maintenance:Prepare a preventive maintenance schedule of any workshop having- air compressors, car washing pumps, tyre changer, lifts, welding machines, and wheel alignment.	SMF410-4	
7	Safety:Demonstrate use of fire fighting and safety related equipments.	SMF410-5	
8	Industrial Visit:Arrange visit to nearby automobile workshop/machine shop.	SMF410-1	

Criteria for Continuous Assessment of Practical Work and Progressive Skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	5
2	Preparedness for practical	10
3	Correct figures / diagrams	05
4	Result table / calculations / graphs	05

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.
4. Factory Visits.

Teaching and Learning Resources, including References of Books:

1. Chalk & Black-Board
2. O.H.P.
3. Slides
4. Video Films.
5. Books:
   i. Maintenance Engineering Handbook by Higgins & Morrow DA Information Services
   ii. Maintenance Engineering by H.P.Garg S. Chand and Company.
   iii. Maintenance of Machine Tools by Gilbirg & Morrow
   iv. Pump-hydraulic Compressors by Audels. McGrew Hill Publication.
   v. Foundation Engineering Handbook by Winterkorn, Hans. Chapman & Hall London

Criteria for Assessment for Semester End Practical exam:

Sr. no	Criteria	Marks Allotted
1	Correct figures / diagrams	5
2	Observation tables	5
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	5
		25

Assessment for Semester End Practical Exam as per Pro-forma V and VI.

LEVEL – V

COURSE ID :

Course Name : INDUSTRIAL ORGANIZATION AND MANAGEMENT
Course Code : CCF501
Course Abbreviation : FIOM

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	Term Work	
Details of Evaluation	Average of two tests of 20 marks each	1. 25 marks for each practical 2. One PST of 25 marks	Term End Online Theory Exam	As per Proforma-III	
Marks	**20**	**--**	**80**	**-**	**100**

RATIONALE :

Management ability is a higher-grade ability, which every successful engineer must possess. This science has been developed in those days when it was treated as an art in earlier stages. It is impossible for an individual though technically sound to achieve goals of the organizations. Effective implementation of management policies is a tough task. The Diploma holder should learn these principles of management and various techniques.

COMPETENCY: Plan and implement managerial and administrative strategies.
Cognitive : Use management principles and techniques.
Psychomotor :i) Apply management principles ii) Control inventory iii) Use personal protective devices for safety
Affective : Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

COURSE OUTCOMES :

CCF 501.1 Apply principles of management and carry out various functions of management.
CCF 501.2 Prepare organization structure for small and medium scale industry.
CCF 501.3 Perform duties of stores in-charge, material and finance manager.
CCF 501.4 Practice industrial safety rules, codes, practices and acts.
CCF 501.5 Apply various modern management techniques.

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 knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO 1 Maintain Electrical equipment	PSO 2 Maintain Electrical power systems	PSO3 Problem Solving on field
Competency: Plan and implement managerial and administrative strategies	2	-	-	-	1	-	1	3	2	2	2	2	---
CCF501.1 Apply principles of management and carry out various functions of management.	2	-	-	-	1	-	1	3	2	2	1	1	---
CCF501.2 Prepare organization structure for small and medium scale industry.	2	2	-	-	2	2	2	3	1	1	0	0	---
CCF501.3 Perform duties of stores in-charge, material and finance manager.	2	2	1	1	-	-	1	3	2	2	2	2	---
CCF501.4Practice industrial safety rules, codes, practices and acts.	2	3	2	1	1	-	1	3	2	2	3	3	---
CCF501.5 Apply various modern management techniques	2	-	-	-	1	-	1	3	2	2	2	2	---

CONTENT :
THEORY :

SECTION –I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
CCF 501.1Apply principles of management and carry out various functions of management.			
1	**PRINCIPLES OF MANAGEMENT** 1.1 Concept of management 1.2 Principles of management 1.3 Objectives of management 1.4 Scope and importance of management 1.5 Levels of management 1.6 Managerial competencies : Communication, Planning and Administration, Team work, Strategic action and General awareness	**06**	**10**
2	**FUNCTIONS OF MANAGEMENT** 2.1 Planning: Forms of planning, Strategic levels and Planning, Phases of Planning 2.2 Decision Making: Decision making conditions, Basic types of Decisions 2.3 Organizing: Introduction to Organization design, basic types of Departmentalization, Co-ordination, Authority 2.4 Motivation: Work Motivation, Three approaches to Motivation, 2.5 Leadership: Leadership and Power, Leadership Development 2.6 Communication: The Communication process, Impact of Information Technology, Hurdles to effective communication 2.7 Controlling: Foundations of control, creative Effective control, Primary methods of control	**08**	**12**
3	**HUMAN RESOURCE MANAGEMENT(Personnel Management)** 3.1 Definition and concept, 3.2 Aim, Objectives and functions of HR dept. 3.2 Principles of personnel policy, details recorded in policy 3.3 Recruitment and selection of employees 3.4 Training : Objectives, benefits, types and methods 3.5 Workers Participation in Management	**06**	**10**
CCF 501.2 Prepare organization structure for small and medium scale industry.			
4	**FORMS OF BUSINESS ORGANISATION** 4.1Types of industrial sectors 4.2 Forms of business organization 4.3 Individual Proprietorship 4.4 Partnership 4.5 Joint stock companies 4.6 Co-operatives 4.7 Public sectors 4.8 Government undertakings.	**04**	**08**
	Total	**24**	**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.

SECTION II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
CCF 501.3Perform duties of stores in-charge,material and finance manager.			
5	**MATERIALS MANAGEMENT** 5.1 Importance of purchase 5.2 Functions and Objectives 5.3 Duties of purchasing officer 5.4 Methods of purchasing and procedure 5.5 Scope and importance of material management 5.6 Objectives of material management 5.7 Duties of Material manager 5.8 Concept of supply chain management 5.9 Modern trends in material management : MRP,ERP	**06**	**10**
6	**FINANCIAL MANAGEMENT** 6.1 Concept, Scope and Importance 6.2 Functions of financial management 6.3 Types of capital: Fixed, working 6.4 Factors affecting Working capital 6.5Capitalization : over, under 6.6 Sources of Finance 6.7 Industrial taxation	**04**	**08**
CCF 501.4Practice industrial safety rules, codes, practices and acts.			
7	**INDUSTRIAL ACT & SAFETY** 7.1 Factory Act, Boiler Act, Workmen Compensation Act, ESI Act, pollution Control Act 7.2 Accidents: Economic aspects, direct and indirect cost of accidents Causes, Types, Remedies, Personal Protective Equipments (PPE), Reporting & Investigation of accidents 7.3 Safety management: safety in industry, committees, programs, Safety codes, Safety training, 7.4 Occupational Safety and Health Administration – Promoting, norms and standards 7.5 Housekeeping: definition, concept, necessity, advantages, procedure	**08**	**12**
CCF 501.5Apply various modern management techniques.			
8	**MODERN MANAGEMENT TECHNIQUES** 8.1 PERT & CPM 8.2 Various terms related with network analysis 8.3 Various Time estimates 8.4 Construction of Network Diagram 8.5 Computation of Critical Path	**06**	**10**
	Total	**24**	**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.			

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	Apply		
1	Principles Of Management	02	04	04	CCF501.1	10
2	Functions Of Management	02	04	06	CCF501.1	12
3	Human Resource management	04	04	02	CCF501.1	10
4	Forms Of Business organization	02	04	02	CCF501.2	08
5	Materials Management	04	02	04	CCF501.3	10
6	Financial Management	02	02	04	CCF501.3	08
7	Industrial Act & Safety	04	04	04	CCF501.4	12
8	Modern Management Techniques	02	02	06	CCF501.5	10
TOTAL		22	26	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.

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. Item Bank

REFERENCE MATERIAL :

a) Books / Journals / IS Codes

Sr. No.	Author	Title	Publisher
1	Bangaand Sharma	Industrial Organisation& Management	Khanna Publisher
2	O P Khanna	Industrial Engg. & Management	DhanpatRai& sons New Delhi
3	P.C. Pandey&C.K.Sing	Management Science	DhanpatRai& sons New Delhi
4	Industrial Organisation	P.T. Ghan	Tata McGraw Hill
5	Management Information System	Waman S. Jawadekar	Tata McGraw Hill
6	P.C. Pandey&C.K.Sing	Management Science	DhanpatRai& sons New Delhi

b) Websites

i) nptel/iitm.ac.in

ii) http://iete.ac.in/subjects/amindustry/Mgmt.htm

COURSE ID:

Course Name : SEMINAR
Course Code : SMF 502
Course Abbreviation : FSEM

TEACHING AND EVALUATION SCHEME:

Pre-requisites: NIL

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	NIL	02
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		Total
	Theory	Practical	Term work*	Oral**	
Duration	Two tests (1hour each)	One practical (2hours)	Seminar	Oral Exam	
Marks	NIL	NIL	25	25	50

* Assessment as per Pro-forma IV and VI.

Rationale:

Most of the engineering activities fall within the category of seminar requiring individual or group decisions, variety of solutions. The purpose of providing seminar in the curriculum is to expose the students to such situations so that they can gain confidence in taking decisions and taking their problem on their own. The emphasis on the project work must shift from teacher centered to student-centered activities and the creative ability of the student to come forward.

A technician should be able to effectively communicate in writing and orally. Proper group functioning is a prerequisite for maximizing output from a problem- solving group in work environment. Proper organization seminar should be able to stimulate such a continuation so that the students are able to work effectively work in a group and thus gain confidenc3e to effectively take up responsibilities in their careers.

COMPETENCY: Develop confidence in decision taking ability, communication & presentation skills.

Cognitive: Understand & apply knowledge of sugar manufacturing process effectively while presentation.

Psychomotor: 1) Communication skills 2) Presentation skills .

Affective: Attitude of 1) precision 2) accuracy 3) Safety 4) punctuality 5) aesthetic presentation.

COURSE OUTCOMES:

SMF502-1 Identify, analyze & define the type of problem.

SMF502-2 Generate alternative solution for problem identified.

SMF502-3 Compare & select feasible solution from alternative generated.

SMF502-4 Design, model making of process equipments.

SMF502-5 Analyze the recent trends in sugar manufacturing process.

SMF502-6 analyzes the need of team building in sugar manufacturing process.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	1	2	1	-	-	-	-	1	1	2	2	1
SMF502-**1**	1	2	1	-	-	-	-	1	1	1	2	1
SMF502-**2**	1	2	1	-	-	-	-	1	1	1	2	1
SMF502-**3**	1	2	1	-	-	-	-	1	1	2	2	1
SMF502-**4**	2	2	2	-	-	-	-	1	1	1	2	1
SMF502-**5**	1	2	1	-	-	-	-	1	1	2	2	1
SMF502-**6**	1	2	-	-	-	-	-	1	1	2	2	1

SEMINAR:

Seminar should be based on deep study of the topics in curriculum so as to facilitate the Industrial Project to be preferred during Higher Studies.

- Improvisation of existing Mill Process of Sugar Manufacture
- Cane harvesting
- Cane preparatory devices
- Juice evaporation
- Crystallization.
- Centrifugation.
- Renewable Energy
- Bagasse as a fuel.
- Present Lay out and Material Handling Problems
- By products of sugar industry.
- Lubrication system in sugar industry.
- Water treatment process.
- Preparation of chemicals used for clarification.
- Boiler &boiler accessories.

Every student will prepare & deliver the seminar and evaluation of seminar will be carried out by panel of at least Two Faculties, One from department &and another from Sugar Industry.

1. Selection of topic for the seminar should be finalized in consultation with teacher guide allotted for the batch to which student belongs.
2. Seminar report should be of min.10 & max. 20 pages & it should be certified by guide teacher and head of the department
3. For presentation of seminar, following guide lines are expected to be followed:
   a) Time for presentation of seminar : 7 to 10 minutes /student.
   b) Time for question/answer : 2 to 3 minutes /student.
   c) Evaluation of seminar should be as follows:

Presentation	15 marks
Use of A.V.aids:	05 marks
Question /answer:	05 marks
Total:	25marks

   d) Use of audio visual aids or power point presentation is desirable
4. Seminar could be on Project based selected by batch.

Criteria for Continuous Assessment of Project Work :

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	04
3	Correct figures / diagrams	05
4	Observation tables	05
5	Result table / calculations / graphs	02
6	Safety / use of proper tools	02
7	Participation in project work	02
	Total	25

Instructional strategies:

7) Lectures and discussions.
8) Laboratory experiences and laboratory interactive sessions.
9) Time bound assignments.

Criteria for assessment at semester end Term Work:

Sr. No.	Criteria	Marks allotted
1	Correct figures / diagrams	05
2	Observation tables	05
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	05
	Total	25

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

COURSE ID:

Course Name : IN-PLANT TRAINING
Course Code : SMF 503
Course Abbreviation : FIT

TEACHING AND EVALUATION SCHEME:

Pre-requisites: SME 403: Sugar Technology –II
SME 405: Sugar Chemical Control, and
SME 406: Capacity Design and Calculation.

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	NIL	28
Practical	28	

Evaluation Scheme:

Component	Progressive Assessment	Semester end				Total
	Practical Training	PST	Weekly report	OR*	TW	
Duration	20 weeks In-Plant Training in Sugar Factory	2 TEST	Performance	Viva voce	Project Report	
Marks	--	50	50	50	50	200

* Assessment (External) as per Pro-forma IV and VI.

Rationale:

In today's scenario the expectations of Industries from Diploma holders are normally high as compared to the competencies acquired by them. In Institute students acquire technical knowledge, information, data, learning experiences and skills from the various courses but the other qualities, talent and personality traits required for supervisors are not given adequate attention in most of the courses. Similarly there are many concepts, principles which can be understood properly if their field applications are demonstrated to the learner.

In the context the above, In-plant Training in Sugar Industry is of prime importance & Compulsory with respect to develop the understanding of the Subject based knowledge given in the classroom in the context of its application at workplaces. It is also essential to encourage and satisfy the curiosity of Students about their role in Industry and to help them to strengthen the theoretical knowledge gained by them during theclassroom instructions**.**

The Students shall undergo Training Program prepared by Department / Institute in the Manufacturing and Functional areas of the Industry in order to gain firsthand experience and confidence; which make possible the students to use and apply the knowledge and skills to solve practical problems in the fields.
During In-plant Training, student should observe the actual working of different units. The student is expected to go through various methods of operations in sugar factory and learn/acquire the skills by working on each/ relevant station in the factory.

COMPETENCY: To develop employability skills like communication skills ,team work ,problem solving, planning and organizing, self management ,discussion making technical skills initiative and enterprise.

Cognitive: Comprehend components/ parts of various machine / equipments.

Psychomotor: Handle the process & make discussion. Abilities like interpersonal skills .

Affective: Attitude of 1) precision 2) accuracy 3) Safety 4) punctuality 5) aesthetic presentation.

COURSE OUTCOMES:

SMF503 -1 Learner will able to collect & prepare the samples from various stations and analyzed.
SMF 503 -2 Learner will able to Conduct special analysis.
SMF 503 -3 Learner will able to consolidate analytical data and tabulate by formula required for preparation report.
SMF 503-4 Learner will able to Discriminating the process equipment and process control instruments in co-ordination with the respective section supervisors and operators.

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	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO1 Plan and Organize	PSO2 Production & Management
Competency	3	2	3	-	-	1	1	3	3	2	3	3
SMF503-**1**	3	2	3	-	-	1	1	2	2	2	3	2
SMF503-**2**	3	2	3	-	-	1	1	2	3	2	3	2
SMF503-**3**	3	2	1	-	-	-	1	-	-	2	2	2
SMF503-**4**	3	2	-	--	-	1	1	3	3	3	3	3

THEORY CONTENTS:

Sr. No.	TOPICS Sub-Topics	Weeks
1	• **LABORATORY TRAINING** • Collect the samples from various stations. Such as mill, boiler, Boiling house, sugar house & ETP. • To prepare chemicals for analysis. • To measure Bx , pol , pty, PH, TEMPERATURE OF VARIOUS SAMPLE LIKE – M.J , P.J , CIJ, sl. J, syrup , AH ,BH, CL, AL, FM , CFW , CAW, BEED, D seed, Am/c Bm/c and Cm/c • **To conduct special analysis of samples like** Juice – R. S , cao , Molasses – R. S,TRS, Ash Lime – cao. Phosphuric Acid- P2o5 content. Brix curve Filter cake – pol , moisture. Bagasse - moisture , pol , fibre Sugar – Temp, moisture , ICUMSA P.I of cane • **Water analysis** • Boiler water analysis – pH , TDS, Hardness , sugar test , condensate analysis PH • E.T.P. water analysis – pH, Temp , BOD , COD. • DM plant – pH , charging / Operating DM plant.	**06**
2	• **LABORATORY CALCULATIONS** • To collect data for – DMR , stock taking , calculate efficiency Figers.	**02**
3	• **PROCESS CONTROL** • To control mill sanitation • To monitor and maintain the required pressure with the help of PRD • To start, close and drain the juice heater , To maintain the temp. of J.H. • To maintain and monitor of pH of juice sulphitor, To measure the Bx of MOL. • To check the juice level, mud level, pH and temp of clarifier. • To maintain and monitor working of sulphur burner, MOL preparation unit , & vacuum filter. . • To check Bx , vacuum , temp , pressure of individual body of evaporator in order to control evaporation rate in the context of steam economy. • To start the injection pump, operate the condenser and create vacuum to pan. In order to facilitate sugar boiling in pan maintain and Monitor vacuum , pressure and operational condition of injection pump and condenser . • **Pan operation**: - To start, cut and drop pan. To prepare slurry, TO	**10**

	maintain and check size (false grain) during m/c boiling. • Maintain the record of pan and crystallizer section (droping starting time, temp. Of the m/c) • To start and stop the batch type and continuous machine. • Gradation of sugar with the help of sieve. • Check quality of P.P. bags and gunny bags. • Check the humidity and temp. Of sugar godown. • Check the pH and temp of inlet outlet Chanel. • To study chemical and mechanical cleaning of evaporator and pan(periodical cleaning) • To maintain equipment relevant work area clean to meet the house keeping standard. • **CRYSTALLISER** • Student must be able to, • Access work place information to identify production requirement. • To observe the gutter connection provided from pan to crystalliser. • To observe the gutter connection provided from crystalliser to pug mill. • Make list of crystalliser according to m/c, cooling type and capacity. • Cheek record of dropping time & temp. – curing starting time & temp. To get high yield. • Check C m/c treatment (vertical crystalliser) • Shut down equipment in response to an emergency situation. • Demonstrate an operational shut down procedure. • Maintain work area to meet housekeeping standard. **CENTRIFUGAL SECTION** • Student must be able to. • Check connection from crystalliser to pug mill and pug mill to machine. • To start the batch / continuity machine and observe all stages of curing up to discharge of the sugar from machine. • To study the working of hopper elevator & grader. • Check temperature , moisture & grades of sugar. • Check the production of sugar (grade wise) in shift.	
4	• DATA COLLECTION AND REPORT WRITING AND MISCELLANEOUS • To comply the details of questionnaire set or Instructional manual provided by the parent department during placement for In-plant Training and submission of project report accordingly.	02

Instructional strategies:

Industrial Training: The students shall under go In-plant Training as per the guide lines in the Instructional Manual & Questionnaire provided by the Department.

It is expected that the following Manufacturing and Functional Areas should be covered.

1. Plant Engineering: Plant Layout, Plant Maintenance (Scheduled and While Operating), House Keening and Safety, Material Handling etc
2. Production Planning and Process Control, Quality assurance, Productivity Improvement techniques, Power Generation Unit.
3. Material Management: Inventory Control, Stores, Sales (final Product as well as By-products)
4. Industrial Engineering: Environment Concern: Effluent Treatment Plant, Other Pollution control methods

Keeping the Manufacturing and Functional Areas of Sugar Industry in mind, the approximate period to be consumed at various Sections or Units during the Training of 20 weeks, a rough plan is given in the Table in order to facilitate the learning experiences of the Students.

Note: Student has to undergo for training in Industry and work as per the Instructions of Chief Chemist / Shift Chemist / Competent authority of Manufacturing Section / Chief Engineer / M.D. on their own risk.

IMPLEMENTATION STRATEGY:

- In-plant training (Industrial Training) at factory sites for total duration of 20 weeks.
- The main goal of the In-plant training is to gain hands on experience i.e. 'Education in Industry' and hence industrial training is to be strictly carried out and implemented as per the details given therein under the sub – head 'Detailed Contents'
- For the fulfillment of the Rationale & Objectives, the Practical In-plant Training has to be well planned, structured, and supervised by Faculties. Schedule for the entire activity of In-plant-training is supposed to prepare by Head of Department/Course Coordinator with utmost care of equal distribution of working hours / academic load to all concerned Teachers. (4 Hrs / Week / Faculty for a Group or Batch of 4 Students)
- The schedule for In-plant training should be well-planned and must be well-balanced, so that concerned teacher can take maximum care for students and pay his maximum attention to achieve the real goal of the training that is "Education in Industry."
- The concerned Teachers who have been entrusted and deputed will visit the factory on regular basis to supervise to see the entire activity of the trainee during training period.
- He should guide the students for trouble shooting as well as see that students will be well conversant with the system and become familiar with the day-to-day problems which may arise during actual manufacturing process even if needed carry out some of the practical which are essential for the course contents.
- ORAL and PRACTICAL examination is to be conducted by appointing one Internal and one External Examiner. Both examiners should conduct ORAL examination based on project Report on In-plant training submitted by the candidates.
- Guidelines in the Instructional Manual or Questionnaire, specifying data to be collected / schedule of the students on day to day basis for whole of their training period has to be provided by the Department before placing the students in an Industry.
- The students may be placed in various sugar Factories / Industries which are in vicinity of the Institute or elsewhere in other Industries which are far off from the Institute.

- Since some of the Factories may be at far distance from the Head Quarter and require some time period to reach there to carry out supervision and guidance work for students. Hence sometimes regular supervision and equal distribution of working hours may not possible practically; due to shortage of Faculty and the distance of Industries. In such condition whenever supervision of such Students (undergone In-plant Training are far away from the Institute) is not possible, a Group or Batch of maximum number of students allowed for In-Plant Training in Sugar Industry (4-6 students) should be formed to monitor the training.
- For effective implementation & justification of Academic Load of the concerned Teacher it is expected to call the respective Group of Students at Institute / Industry (weekly without hampering the Training) for teaching and performing/ carrying out some practical in the Department (which are essential for course contents). The concerned Teacher will also guide the students w r t the problems which may be raised during actual In-plant Training.
- For a Group or Batch of 4-6 students a **Teaching** / **Practical load** of **4 Hrs / Week / Faculty** / Group shall be considered as a Academic Load of Department. This consideration will help to rationalize/equalize the total load of **28 hours / week** of the Course.
- In addition to this, while preparing the Time- schedule for In-plant- Training, the Principal / Head of Department / Course Coordinator should also see that during the visits to industry/ies, the concerned teachers, deputed for their duties of supervision and guidance, also update their knowledge regarding the latest developments in technology in Sugar Manufacturing.
- Hence, there should be some time-provision to be made in the In-plant- Training Time – schedule for the above said as a parallel / simultaneous activity of reinforcing / updating the knowledge level of Teachers.

PST-I (Phase I) Is taken after one and half month complication of training .Test is based on laboratory analysis practical's and calculations.
PST-II (Phase II) Is taken after three month complication of training .Test is based on process/ practical knowledge assessment.

Criteria for Continuous Assessment of weekly report.

Sr. no	Criteria	Marks allotted
1	Attendance at Factory	10
2	Preparedness, Involvement in practical Training, Safety / Use of proper tools ,collection of Information/Correct figures / diagrams Observation tables, Result table / calculations / graphs/ Over all Project Report	20
3	Work done as per the Instructions of Chief Chemist, Overall Performance during training .Filling In-plant training Progress Report	20
	Total	50

Criteria for Continuous Assessment of progressive skill test.

Sr.No.	CRITERIA	MARKS ALLOTTED
PST 1	Practical/ Writing skill. Practical knowledge Assessment based on training experience obtained in first phase of in plant training.	10 15
PST 2	Process/ practical assessment based on training experience obtained in second phase of in plant training	25

COURSE ID:

Course Name : COGENERATION TECHNOLOGY
Course Code : SMF 504
Course Abbreviation : FCGT

TEACHING AND EVALUATION SCHEME:

Pre-requisites: Nil

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Semester end		
	Theory	Practical	Theory	Oral *	Term Work
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL	T W
Marks	20 each	--	80	25	25

* Assessment as per Pro-forma IV and VI.

Rationale:

The Sugar Industry by its inherent nature can generate surplus energy in contrast to other Industries, which are only consumers of energy. Energy is one of the major inputs for the economic development of any country. In the case of the developing countries, the energy sector assumes a critical importance in view of the ever increasing energy needs requiring huge investments to meet them. With liberalization and increased competition, the generation and selling of excess power to the electricity boards, offers an excellent source of revenue to the Sugar Industries. This is referred to as commercial co-generation and has been only tapped in our country.

The Sugar Industries have been adopting co-generation right from the beginning. However, the co-generation has been restricted to generating power and steam only to meet the operational requirements of the plants. Now a day, with the increasing power demand and shortage, commercial co-generation has been found to be attractive, both from the State utility point of view as well as the Sugar Industry point of view.

This Course is dealt with an introduction to the new emerging concept of Co-generation Technology with the aim to enhance the knowledge with respect to various sources of energy, Bagasse based cogeneration, Important technical parameter for cogeneration its Technology and energy conservation.

COMPETENCY:

Applying the knowledge of new emerging concept of cogeneration tech. to save energy in S.I. as follows:

Cognitive: Understand and applying principle of energy management & energy conservation.
Psychomotor: i) Calculating skills ii) Operating skills iii) Management skills
Affective: Attitude of i) Precision ii) Accuracy iii) Safety iv) Punctuality.

COURSE OUTCOMES:

SMF504-1. State the types of energy sources & its scenario.
SMF504-2 Classify sources of energy & sources of power generation
SMF504-3 Importance of cogeneration & need of cogeneration in S.I.
SMF504-4 State the type of cogeneration systems.
SMF504-5 Analyze he prime movers & assessment of cogeneration systems
SMF504-6 Analyze importance of boiler in cogeneration.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency: Applying the knowledge of new emerging concept of cogeneration tech. to save energy in S.I	2	2	1	--	-	-	-	-	2	1	2	2
SMF504-1 State the types of energy sources & its scenario.	2	2	1	--	-	-	-	-	1	1	2	1
SMF504-2 Classify sources of energy & sources of power generation	2	1	2	--	-	-	-	-	2	1	2	2
SMF504-3 Importance of cogeneration & need of cogeneration in S.I.	2	1	1	--	-	-	-	-	2	1	2	2
SMF504-4 State the type of cogeneration systems.	2	2	1	--	-	-	-	-	2	2	1	2
SMF504-5 Analyze he prime movers & assessment of cogeneration systems	1	2	1	--	-	-	-	-	2	1	2	1
SMF504-6 Analyze importance of boiler in cogeneration.	1	2	1	--	-	-	-	-	2	2	2	2

Section I

Sr No	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
	Course Outcomes SMF504-1. State the types of energy sources & its scenario.		
1	**Energy Scenario:** **1.1** Commercial and Non-Commercial Energy **1.2** Primary Energy Resources **1.3** Commercial Energy Production **1.4** Final Energy Consumption **1.5** Energy Needs of Growing Economy **1.6** Energy Pricing **1.7** Energy and Environment: Air Pollution, Climate Change.	06	10
	Sources of Energy **1.8** Introduction, Classification of Sources of energy **1.9** Comparison between Conventional and non-conventional energy sources **1.10** Heat energy & Hydraulic energy **1.11** Solar Energy &Nuclear energy **1.12** Tidal energy &Wind energy **1.13** Geothermal energy & Bio-gas, Bio-mass etc their application and Merits and limitations.	08	12
	Course Outcomes SMF504-2 Classify sources of energy & sources of power generation		
2	**Cogeneration:** **2.1** Introduction to Cogeneration: What is cogeneration? **2.2** Why Cogeneration, Background, **2.3** Need for Cogeneration **2.4** Principle of Cogeneration, **2.5** Benefits of Cogeneration **2.6** Scope of Cogeneration or Combined heat and energy production in Sugar Industry.	04	08
	Course Outcomes SMF504-3 Importance of cogeneration & need of cogeneration in S.I.		
3	**Bagasse Based cogeneration:** **3.1** Why bagasse co-generation, **3.2** Rational for co-generation from bagasse, **3.3** Availability of Bagasse, Importance of bagasse saving **3.4** Alternate fuels – cane trash, filter cake, spent wash etc **3.5** Flow chart of bagasse co-generation process, **3.6** Bagasse based co-generation Technology description **3.7** Economical, Social & Environmental benefits of bagasse co-generation **3.8** Current Status & Future potential for bagasse cogeneration in India.	06	10
		24	**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.

Section II

Sr. No.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcomes SMF504-4 State the type of cogeneration systems.			
4	**Cogeneration Technologies:** **4.1** Technical options for cogeneration **4.2** Types of cogeneration systems **4.3** Steam turbine cogeneration System **4.4** Gas turbine Cogeneration system **4.5** Reciprocating engine cogeneration system **4.6** Classification of cogeneration systems **4.7** Topping cycle & Bottoming cycle **4.8** Factors influencing Cogeneration choice **4.9** Important technical parameter for cogeneration:- Heat to power ratio, Quality of thermal energy need, load patterns, Fuel available, System reliability.	**08**	**12**
Course Outcomes SMF504-5 Analyze he prime movers & assessment of cogeneration systems			
5	**Prime movers for Co-generation:** 5.1 Introduction to Prime movers: Steam turbine, Back pressure turbine, Extraction condensing steam turbine Gas turbines 5.2 Energy Efficiency or saving opportunities in steam turbine and in co-generation system, Boiler & Turbo Generator capacity, 5.3 Pressure & Temperature of Steam required, Feed Water temperature etc.	**06**	**10**
	Assessment of Co-generation System: 5.4 Introduction to assessment of co-generation system: (Only terms & definitions involved in performance calculations (No numerical)) 5.5 Energy Conservation And Audit: Importance of Energy Security, Energy Conservation 5.6 Introduction and purpose of Energy Conservation Act-2001. 5.7 Energy Management, Types & Need for Energy Audit.	**04**	**06**

Course Outcomes SMF504-6 Analyze importance of boiler in cogeneration.			
6	**Role of Boiler in Cogeneration:** **6.1** Boiler System Schematic diagram, **6.2** Introduction to Performance evaluation of boilers: Definition of boiler efficiency & two method of assessing boiler efficiency **6.3** Advantages & disadvantages of direct & indirect Methods **6.4** Importance & benefits of Blowdown **6.5** Importance of boiler water treatment. **6.6** Effect of silica & Impurities causing Deposits on Quality of steam 6.7 Difference between internal & external water Treatment **6.8** Recommended boiler & feed water quality for low, medium & high pressure boilers. **6.9** Role & function of Steam trap.	**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.			

Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			CO	Total marks
		Remember	Understand	Application		
I / 1	**Energy Scenario**	02	04	04	SMF504-1	10
	Sources of Energy:	02	04	06	SMF504-1	12
I / 2	**Cogeneration**	02	02	04	SMF504-2	08
I / 3	**Bagasse Based Cogeneration**	02	04	04	SMF504-3	10
II / 4	**Cogeneration Technologies**	02	04	06	SMF504-4	**12**
II / 5	**Prime Movers For Cogeneration**	02	04	04	SMF504-5	**10**
	Assessment of Co-generation System:	02	04	--	SMF504-5	**06**
II / 6	**Role of Boiler in Cogeneration:**	02	04	06	SMF504-6	**12**
		16	30	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.

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
01	To study Energy Needs of Growing Economy and its impact on Environment.	SMF504-1	To know and understand practically various pollutants causes Pollution
02	To Study the one of the various sources of energy. (Study and demonstrate residential solar water heating system)	SMF504-2	To identify and understand the function of solar water heating system.
03	To Study the Bagasse based Cogeneration system. (Case Study)	SMF504-2	To observe and understand the Bagasse based Cogeneration.
04	To find out calorific value of Bagasse.	SMF504-2	To understand the performance of Boiler on the basis of TCD of the Factory Visited
05	To study prime movers for bagasse cogeneration in Sugar Industry.	SMF504-5	To develop ability to analyze the performance of Steam consuming Units in Sugar Industry.
06	To study importance of Boiler feed water and Boiler water treatment w r to effect of various parameter (like pH, Hardness, TDS) on steam generation.	SMF504-6	To develop ability to analyze the various parameter of water used for steam generation in cogeneration Plant.
07	Report of Industrial Visit to Sugar Industry/Cogeneration Plant.	SMF504-1	To understand practically working of the Cogeneration System.

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

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

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.

Teaching and Learning resources, including references:

1. Chalk-board.
2. Demonstrative kits.
3. Demonstrative charts.
4. Books:
    - Cogeneration : Bureau of Energy Efiiciency.: https://beenet.gov.in/
    - Cogeneration: www.energyefficiencyasia.org
    - http://www.retscreen.net/
    - http://www.indiansugar.com/Cogeneration.aspx
    - http://sugarcane.org/resource-library/books/
    - http://beeindia.in/energy_managers_auditors/documents/question_bank/
    - http://beeindia.in/energy_managers_auditors/documents/exam/

Criteria for assessment at semester end practical exam:

Sr. no	Criteria	Marks allotted
1	Correct figures / diagrams	05
2	Observation tables	05
3	Result table / calculations / graphs	10
4	Safety / use of proper tools / workmanship	05
	Total	25

COURSE ID:

Course Name : ALCOHOL TECHNOLOGY
Course Code : SMF 505
Course Abbreviation : FALT

TEACHING AND EVALUATION SCHEME:

Pre-requisites: Nil

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

Evaluation Scheme:

Component	Progressive Assessment		Semester end			Total
	Theory	Practical	Theory	Oral *	Term Work	
Duration	Two tests (1hour each)	One practical (2hours)	One paper (3 hours)	ORAL	T W	
Marks	20 each	--	80	25	25	150

* Assessment as per Pro-forma IV and VI.

Rationale:

During last century, alcohol technology has greater importance in chemical industry because of its use in medicine; paint, as a solvent etc. There has been tremendous growth in various fields of chemical industry. The knowledge of this development is useful in understanding the future needs of chemical industry. All the chemical industry basically requires unit operations & unit processes. The basic content like fermentation, distillation and microbiology are covered in the contents, which will help in understanding the higher levels of subjects.

COMPETENCY:
To awareness about working culture in Distillery.

Cognitive: Understand basic content like fermentation, distillation & microbiology.
Psychomotor: 1) management skills 2) manpower handling 3) Material handling.
Affective: Attitude of 1) precision 2) accuracy 3) Safety 4) punctuality 5) aesthetic presentation.

COURSE OUTCOMES:

SMF505-1 Understand unit process and operations related to alcohol technology.

SMF505-2 Differentiate between yeast enzymes & bacteria.

SMF505-3 Understand stimulation and acclimatization of yeast.

SMF505-4 Know process flow chart of alcohol & alcohol based products.

SMF505-5 Explain effluent treatment process of distillery.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Organize**	**PSO2 Production & Management**
Competency	2	2	1	-	-	-	-	-	2	2	3	2
SMF505-1	2	2	1	-	-	-	-	-	2	1	2	2
SMF505-2	2	2	1	-	-	-	-	-	1	1	2	2
SMF505-3	1	2	1	-	-	-	-	-	2	2	3	2
SMF505-4	1	2	1	-	-	-	-	-	2	1	2	2
SMF505-5	2	2	1	-	-	-	-	-	2	2	2	2

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Section I

SrNo	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
Course Outcome SMF505-1 Understand unit process and operations related to alcohol technology.			
1	**Unit Processes and operations related to alcohol Technology:** Batch fermentation: Continuous Distillation, Azeotropic Distillation, Evaporation.	04	12
Course Outcome SMF505-2 Differentiate between yeast enzymes & bacteria.			
2	**Applied Microbiology:** Yeast , Enzyme and Bacteria:Definition, comparison with other microorganisms, Yeast morphology and Taxonomy, Nutritional requirement of yeast, Pre treatment (Liquefaction) of Enzyme, Enzyme dosing, Bacteria used for fermentation.	10	14
Course Outcome SMF505-3 Understand stimulation and acclimatization of yeast.			
3	**Stimulation and Acclimatization of yeast:** Material of construction and maintenance of yeast vessel : Pre fermentation practices adopted for yeast propagation, Propagation practices of yeast, Yeast Acidification, Use of sterile air system in pre-fermenter.	10	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	Teaching (Hours)	Theory Evaluation Marks
Course Outcome SMF505-4 Know process flow chart of alcohol & alcohol based products..			
1.	**Alcohol Technology:** Raw Material, Reaction, Flow Diagram and Process Description of the following: Manufacturing of Malt alcohol, Manufacturing of Rum, Manufacturing of Whisky, Manufacturing of Brandy, Manufacturing of Vodka, Manufacturing of Industrial Spirit.	**14**	**22**
Course Outcome SMF505-5 Explain effluent treatment process of distillery.			
2	**Effluent Treatment:** Content of waste: Toxicological effect, Government stipulated condition for Alcohol Industry waste water, Primary treatment, and Biological treatment.	**10**	**18**
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	CO	Distribution of marks (level wise)			Total marks
			Remember	Understand	Application	
I / 1	Unit Processes and operations related to alcohol Technology.	SMF505-1	04	06	02	12
I / 2	Applied Microbiology	SMF505-2	06	06	02	14
I / 3	Stimulation and Acclimatization of yeast	SMF505-3	06	06	02	14
II / 4	Alcohol Technology	SMF505-4	08	08	06	22
II / 5	Effluent Treatment	SMF505-5	06	06	06	18
			30	32	18	**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.

Laboratory experiences and related skills developed.

Sr. no	Laboratory experience	CO	Skills developed
01	Determination of total solids and suspended solids of molasses	SMF505-1	Apply principles to select proper material for given products
02	Determination of brix, specific gravity, pH of molasses.	SMF505-1	Interpret the test results
03	Propagation of yeast in laboratory Study of alcohol from sweet potato	SMF505-2	Judge the density of given polymer
04	Determination of starch in grain sample Study of different types of microorganisms used in fermentation process.	SMF505-3	Handle chemicals carefully & safely
05	To determine the reducing sugar in the given sample of molasses.	SMF505-4	Prepare various tests as per standard
06	To conduct potassium permanganate test for finding the quality of spirit	SMF505-4	Handle the instruments properly
07	Determination of methyl alcohol content of spirit	SMF505-4	
08	Visit to Nearby Distillery / Sugar plant.	SMF505-1	To understand practically working Alcohol Technology.

Criteria for Continuous Assessment of Practical work and Progressive Skill Test:

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

Instructional strategies:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments.

Teaching and Learning resources, including references:

1. Chalk-board.
2. Demonstrative kits.
3. Demonstrative charts.
4. Books:

- Alcoholometry by T.P.Lyon, Dr. Kelsall,
- The Alcohol Textbook By Jacques,
- Handbook of fermentation & Distillation by A.C.Chatterjee
- Distillation By H.C.Baron
- Fermented Food Beverages in Nutrition, Gastineau CF, Darby WJ and Turner TB, 1979, Academic Press.
- Advances in Biotechnology, Moo-Young M, 1981, Pergamon Press.
- Fermentation Biotechnology: Principles, Processes and Products, Ward OP, 1989, Prentice-Hall.
- Principles of Fermentation Technology, Stanbury PF, Whitaker A and Hall SJ, 1997, Elsevier.
- Byproducts of Sugar Industry by Paturao

COURSE ID :

Course Name : ENERGY CONSERVATION & AUDIT
Course Code : SMF506
Course Abbreviation : FECA

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		
	Theory	Practical	Theory	Oral*	Term Work
Duration	Two tests (1 Hour each)	One Practical (2 Hours)	One Paper (1 Hours)	Oral	TW
Marks	20 each	-	80	25	25

* Assessment as per Pro-forma III for TW

RATIONALE :

Technological development in all sectors has caused imbalance in energy generation and it's consumption. Energy conservation is a scientific tool provided to minimize the energy imbalance. This is one of the rapid emerging field in the area of engineering hence this has been included as core technology subject.

The contents on energy conservation techniques in lighting techniques in lighting systems, Induction Motors, Air Compressors, Mixers, Dumpers, Cranes, Sanitary Equipment, will be useful to reduce energy losses and wastage in commercial and industrial sectors.

The topic on energy audit will be useful tool to participate in energy conservation program of the nation.

COMPETENCY

Apply principles of energy management to solve construction problems as follows.

Cognitive : Understanding and applying principles of energy management to solve civil engineering problems.

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 vi) hygiene vii) civic sense

COURSE OUTCOMES:

SMF506-1.Identify the need of Energy Conservation.
SMF506-2 Suggest methods to improve Energy Conservation.
SMF506-3 Identify Energy Conservation opportunities.
SMF506-4 Use Energy Conservation Building Code to build energy efficient buildings.
SMF506-5 Use WBP to build energy efficient buildings.
SMF506-6 Identify the opportunity to reduce the energy bill.

SMF506-7 Use of IGBC to build energy efficient buildings.
SMF506-8 Select proper Energy conservation equipments.
SMF506-9 Select Energy Audit instruments.

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	**PO 2 Discipline knowledge**	**PO 3 Experiments and practice**	**PO 4 Engineering Tools**	**PO 5 The engineer and society**	**PO 6 Environment and sustainability**	**PO 7 Ethics**	**PO 8 Individual and team work:**	**PO 9 Communication**	**PO 10 Life-long learning**	**PSO1 Plan and Design**	**PSO2 Construction and Maintenance**
Competency:	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-1.	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-2	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-3	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-4	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-5	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-6	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-7	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-8	2	1	-	-	-	-	-	1	1	1	2	1
SMF506-9	2	1	-	-	-	-	-	1	1	1	2	1

CONTENT :THEORY

Section – I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course Outcome- **SMF506-1**.Identify the need of Energy Conservation.		
1	**Energy Conservation** 1.1 Present energy scenario of world and India and need of energy conservation . 1.2 Energy and Conservation : Defination, Importance of energy conservation, Impact on environment and economy 1.3 Role of renewable energy in energy conservation . 1.4 Bureau of energy efficiency : Its formation and functions. 1.5 Function of Government Organisation in the field of energy conservation (NPC, MNRE, BEE, APEDA)	**02**	**06**
	Course Outcome- **SMF506-2** Suggest methods to improve Energy Conservation		
2.	**Energy Conservation in Lighting system** 2.1 Basic terms used in Lighting system (Illumination). 2.2 Recommended Luminance levels. 2.3 Procedure for assessing existing lighting system in facility. 2.4 Energy Conservation techniques in lighting system. • By replacing lamp sources • Using energy efficient luminaries • Using light controlled gears • By installation of separate transformer / servo stabilizer for lighting • Periodic survey and adequate maintenance programs • Energy Conservation techniques in fans , electronics regulators .	**08**	**12**

	***Course Outcome*- SMF506-3** Identify Energy Conservation opportunities.		
3	**Energy Conservation in transformers &distribution** 3.1 Need of energy conservation in transformers 3.2 Energy efficient transformers -Amorphous transformers -Epoxy resin cast transformers(dry type transformer) 3.3 Periodic maintenance 3.4 Types of losses in distribution system(commercial &Technical losses) 3.5 Energy Conservation techniques distribution system related to technical losses -By reducing I^2R losses. -By compensating reactive power flow. -By optimizing distribution voltage. -By balancing phase currents. -By using energy efficient transformers. 3.6 Energy conservation techniques related to Commercial losses.	**06**	**08**
	***Course Outcome* – SMF506-4** Use Energy Conservation Building Code to build energy efficient buildings.		
4	Energy conservation Building Code (ECBC) 4.1 Purpose of the code 4.2 Scope of its use 4.3 Applicable building systems and exceptions 4.4 Compliance requirements 4.5 National Building Code 4.6 Mandatory requirements for new building 4.7 Power consumptions, rating of appliances and equipments (star rating) 4.8 Climate zones of India used in ECBC 4.9 ECBC requirements for different climate zones	**08**	**14**
Total		**24**	**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.			

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Course Outcome – **SMF506-5** Use WBP to build energy efficient buildings.		
5	**Whole Building Performance (WBP)** 5.1 Benefits of WBP 5.2 Scope of WBP : No HVAC in the building, alteration, additions to existing buildings, application of code for exclusion for part of existing building 5.3 steps for compliance of ECBC for WBP method 5.4 Documentation requirements	**02**	**04**
	Course Outcome **SMF506-6** Identify the opportunity to reduce the energy bill.		
6	**Relation between tariff and Energy Conservation** 6.1 Type of tariff structure 6.2 Terms involved in tariff 6.3 Specific tariff : Time of day tariff Peak of day tariff Power factor tariff Maximum demand tariff Load factor tariff 6.4 Application of tariff system to reduce energy bill 6.5 Simple numerical based on power factor and load factor tariff	**05**	**08**
	Course Outcome – **SMF506-**7 Use of IGBC to build energy efficient buildings.		
7	**Leadership in energy and environment design (LEED) and Indian Green Building Council** 7.1 Meaning of the term LEED 7.2 Brief History 7.3 Credit categories and distribution of base points for these categories and level of certifications 7.4 Indian Green Building Council (IGBC) 7.5 IGBC Green new buildings rating systems 7.6 Scope and benefits of IGBC 7.7 Levels of certification	**05**	**08**

	Course Outcome **SMF506-8** Select proper Energy conservation equipments.		
8	**ENERGY CONSERVATION BY COGENERATION** 9. What is cogeneration? 10. Need for cogeneration. 11. Classification of various cycles of cogeneration systems. 12. Classification of cogeneration systems on the basis of technology: - Gas Turbine, Steam Turbine, Reciprocating Engine, Solar & Wind Power Generation. 13. Factors influencing Cogeneration Choices. 14. Benefits of Cogeneration systems. 15. Advantageous of cogeneration	**07**	**12**
	Course Outcome **SMF506-9** Select Energy Audit instruments.		
9	**Energy Audit** 9.1 Energy flow diagrams and its significance 9.2 Energy audit instruments and their use. 9.3 Prepare questionnaire for energy audit projects. 9.4 ABC analysis and its advantages referred to energy audit projects. 9.5 Energy Audit procedure (walk through audit and detailed audit) 9.6 Calculation of simple payback period (simple numerical)	**05**	**08**
TOTAL		24	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.			

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	Energy Conservation	02	02	02	SMF506-1	06
2	Energy Conservation in Lighting system	02	04	06	SMF506-2	12
3	Energy Conservation in Lighting system	02	02	04	SMF506-3	08
4	Energy Conservation Building Code	02	06	06	SMF506-4	14
5	Whole Building Performance (WBP)	02	02	--	SMF506-5	04
6	Relation Between Tariff & Energy Conservation	02	02	04	SMF506-6	08
7	Leadership in Energy &Environmental Design (LEED)&(IGBC)	02	02	04	SMF506-7	08
8	Energy Conservation by cogeneration	02	04	06	SMF506-8	12
9	Energy Audit	02	02	04	SMF506-9	08
TOTAL		18	26	36		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.)

F) TERM WORK

Practical Exercises and related skills to be developed :

The following practical exercises shall be conducted as Term Work practical sessions of batches of about 20 students :
Termwork is devidedin three parts as below –
1) Field visits.
2) Assignment work**.**
3) Market Survey

Practicals

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
1	**A. Field visits –** 1) collect the information about Energy conservation Building Code. 2) Visit to any organization Where Energy Conservation program is implemented.(e.g.Hospitals,Workshops, Commercial Buildings, Residential buildings.)	3. Information collection and presentation in form of report 4. Motivation through field exposure	CEF315-1toCEF315-09
2	**B . Market Survey** 1) Collect information by market survey and prepare report on specifications,cost,list of manufacturers of various types of energy efficient Induction Motors, Air Compressors,Mixers Dumpers,Cranes,Sanitary Equipments,Air Conditioners etc.	8. Self learning ability 9. Presentation skills	SMF506-1 to SMF506-09
3	**C. Assignments:** 8. Prepare write up on role of energy manager and energy auditor. 9. Make a comparative study of energy efficient motors, Air compressors, Mixers, Dumpers, cranes, sanitary equipments, Air conditioners etc. Used in construction industry and service industries on the basis of energy efficient, cost, life, energy saving and saving in energy bill. 10. Using various energy audit instruments used for measurement of electrical , mechanical and thermal energy parameters, carryout energy audit and prepare a report as a case study for Residence, small workshop, public library, hospital etc. (inclusive of Data Collection processes)	1.Information collection and presentation in form of report 2.Motivation through field exposure	SMF506-1 TO SMF506-9
	D. Practicals 1. Study design of existing building Applying IGBT standards and rate the Building. 10. Study of different passive techniques to reduce Energy consumption. 11. Study of different Electrical fixtures in the building to reduce energy consumption. 12. Study of planning &Designing concepts for energy saving & thermal comfort in the buildings.	1.Information collection and presentation in form of report 2.Motivation through field exposure	

G) 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

ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

k) Assessment Criteria for Term work :

i) Continuous Assessment of Term Work:
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
TOTAL		**50**

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 IV*.

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 :
Books / Journals / IS Codes / Websites

a)Reference Books:

Sr. No.	Author	Title	Publisher
1.	S. Sivanagraju M. Balasubba Reddy D. Srilatha	Generation and Utilization of Electrical Energy	Pearson, New Delhi
2.	P.H. Henderson	India – The Energy Sector	University Press
3.	W.C. Turner	Energy Management Handbook	Wiley Press
4.	B.G Desai J. S. Rana A.V. Dinesh R. Parmar	Efficient Use And Management of Electricity In Industry	Devki Enegery Consultancy PVT. Ltd
5.			

d) Websites:

1. Website of bureau of energy and efficiency: WWW.bee-india.nic.in
2. Website of Akshay Urja News Bulletin : WWW.mnes.nic.in
3. Notes on energy management on : WWW.energymanagertraing.com
4. WWW. Greenbusiness.com
5. WWW. Worldenergy.org
6. WWW. Mahaurga.com (For Case Studies)
7. ECBE. User Guide 2010

IN-PLANT TRAINING INSTRUCTIONAL MANUAL

DEPARTMENT OF SUGAR TECHNOLOGY

IN PLANT TRAINING INSTRUCTION MANUAL
FOR
DIPLAOMA IN
SUGAR MANUFACTURING

GOVERNMENT POLYTECHNIC KOLHAPUR
(An Autonomous Institute of Government of Maharashtra State)
Vidya Nagar Kolhapur 416004
Ph: 0231-2521038 Fax: 0231-2521016
Email: gpkolhapur@yahoo.com Website:-www.gpkolhapur.org.in

"The training by which current and expression of will is brought under control and becomes fruitful is called as Education." -**Swami Vivekananda**

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"Excellence is an art own by training and habituation. We do not act rightly because we have virtue of excellence, but we rather have those because we have acted rightly. We are what we repeatedly do. Excellence, then, is not an act but a habit."

- **Aristotle (Ancient Greek Philosopher, Scientist and Physician)**

Important date to be remembered

Sr. No.	Dates / Schedule Activity
1	18th December 2017 reporting for In Plant Training in allotted Sugar Industries.
2	Last date of Submission of joining Report to the Institute: 30th December 2017.
3	Form No.2 In Plant Training Progress Report to get signed by Faculty at the time of Scheduled Factory visit.
4	Submission of In Plant training and Confidential Report: 10th April 2018.
5	Final In Plant Training and Project Report Submission: 22nd April 2018.
6	Seminar and Viva-voce as per Time Table Displayed on

The forms given in this manual are of prime importance to maintain the sanctity of training. You are requested to completely fill the forms religiously and submit it to the appropriate authorities from time to time.

Keeping the Manufacturing and Functional Areas of Sugar Industry in mind, the approximate period to be consumed at various Sections or Units during the Training of 16 weeks, a rough plan is given in the Table in order to facilitate the learning experiences of the students.

Sr. No.	Section / Units	Periods in Weeks
1	**Laboratory Training:** Laboratory Analysis Brix, Pol, Purity, Various Products is a intermediate product in sugar manufacturers, To conduct special analysis of different sample as Reducing sugar, Total Sugars, Phosphates content, CaO content, Moisture content etc.	02
2	**Working of Laboratory In-Charge:** Calculation of daily averages, daily reports, Weekly Periodical Reports, values of different equipments stock taking sugar balance etc.	02
3	**To work, observe & Study the milling process, boilers and Turbines.**	03
4	**Clarification of juice:** Process evaporation, Heating, Clarification, Settling of juice with equipments, Sugar boiling process in detail with boiling scheme adopted. Crystallization system, Centrifugation during gradation & Bagging of Sugar.	06
5	**By-Products of Sugar Industry and Environment Concern:** To study By-products of sugar, Effluent water treatment plant & Methods, Pollution control measures.	01
6	**Data Collection and Report Writing and Miscellaneous:** To comply the details of **Questionnaire** set provide by parent department during placement for In-Plant Training and Submission of Project Report accordingly.	02
	Total	16

OBJECTIVES

The Students shall undergo Training program prepared by Department as per the need of Course in the Manufacturing and Functional areas of the Industry in order to gain first hand experience and confidence: which make possible the students to use and apply the knowledge and skills to solve practical problems in the fields. In-Plant training is meant to correlate theory and actual practices in the Industry. Students are exposed to Industrial environment, which cannot be simulated in the Institute. Through the In-Plant Training;

The student will be able to

- Know entire process of sugar manufacture with logical sequence and Learnt Industrial environment and Work Culture.
- Work at each station, section, laboratory independently under factory discipline.
- Use different formulae to calculate various figures & report and Handle and control the process effectively & independently.
- Realize the size and scale of operational Industry.
- Get convergent/familiar with various Design, Manufacturing, Analysis, Automation and Purchas, Material Management, Machines, Processes, products and their applications along with relevant aspects of Industry Management.
- Understand the psychology of the workers, their habits, attitude and approach to problems along with the practices followed either at factory or at site.
- Develop understanding of various field activities in which students are going to assist the shift Chemist after completing this program.
- Understand layout of Plant/Factory/Shop Floor/Sub-station etc.
- Understand the working principle/operations/functions/specifications of various Machines/Equipments/Instruments by observing.
- Comprehend components/parts of various Machines/Equipments.
- Know maintenance System various Machines/Equipments.
- Develop skill of communication by interacting with Managers/Engineers/Supervisors/Operators.
- Improve the ability of learning by reading Literature available in Industry like Operational Manual/ Maintenance Schedule/Standards etc.
- Explore themselves by gathering primary/secondary data/information through various sources and analyzing & interpreting the same. Develop the skill of analyzing and interpreting.
- Develop social skills (related to Psychomotor & Affective domain) and ability like interpersonal skills, Communication Skills, Attitudes, and Values Like: Self Development and assessment, Self-Assessment and Self-Awareness, Perception and Attitudes, Values and Belief System.
- Personal Goal Setting, Career Planning, Self-Esteem, Building of Self-Confidence.
- Listening skills, verbal Communication. Includes Planning, Preparation Delivery.
- Feedback and Assessment of activity like Public speaking, Group Discussion, Oral presentation skills, Perfect Interview.
- Listening and Observation skills, Body language, Use of Presentation graphics, Use of Presentation aids, Study of Communication.

- Write Communication, Technical Writing-technical Reports, project proposals, Brochures, Newsletters articles, Technical manuals, Official/business Correspondence- Business letters, Memos, Progress Report, Minutes of Meeting, Event Reporting, Vocabulary for effective technical writing, Improvement Personal Memory.
- Use of: Tools, Guidelines for technical writing, Publishing Ethics and Etiquettes.
- Practice Business Ethics Etiquettes in social as well as office settings, Email etiquettes, Tele-phone etiquettes, Engineering ethics and ethics as an IT professional, Civil Sense, Environmental concern etc.
- Develop Skills such as managing time, Meditation, understanding rules of Engineer and their responsibility, rapid reading, Notes taking, Complex Problem Solving.
- Gain/Avail opportunity to apply their knowledge in problem Solving and in Project Assignment by using techniques.
- Understand various constraints of time and cost within which goods are produced and services rendered in specified quantum.
- Appreciate need for co-ordinate efforts of various persons at different levels in different departments in achieving set Goals and Targets.
- Understand the Scope, Functions and job responsibility in various departments of an Organization. This is very good opportunity to learn under a different environment but students gain is dependent on positive attitudes and approach to training, keenness and attitude of enquiry to learn.

DO'S AND DON'TS FOR THE STUDENTS DURING IN-PLANT TRAINING

Your attitude and discipline should be exemplary. Maintain good relation with the company Officials and Authorities.

1. Maintain excellent relation's with all and particularly with your supervisor(s).
2. Be punctual and regular. In case of difficulties, approach your supervisor.
3. Write your diary daily and show it to your supervisor(s) whenever they demand.
4. Permit for your physical check by the security man of the organization, If required.
5. Maintain good health throughout the training.
6. Show exemplary behavior by observing the manners and etiquettes.
7. Always carry Identity Card and produce the same on demand.
8. Do not disturb the workers in their work and do not enter in to any discussion with them.
9. Do not record any information or copy out any drawing or part thereof without prior and proper permission.
10. Do not operate any Instrument / Machine / Apparatus without specific instruction of your supervisor and without his supervision.
11. Do not carry any valuables.
12. Students who are found to be irregular, misbehaving in any way or indulging in any mischief will have to face disciplinary action.

WHAT TO LEARN DURING IN-PALNT TRAINING

During the In-Plant training period, the students should try to learn different aspects of Professional Industry. Following aspects whichever are applicable should be included in your study apart from the questionnaire or Guide-Lines given to you.

- History: industry, Product Information, Capacity of the plant, is the company quoted on the stock exchange, locally, International, if so how has their share price varied during your time with the company? (Type of Industry-Public Limited, Private Limited, Co-operative Sector etc.
- Location; Site Plan/Plant Layout, Flow Diagram / Process Diagram.
- Technologies it relies on, Manufacturing processes, drawing (if available), the type, model, age, specification of machinery in use, the type of oils, greases, coolants etc. Specified for use in or on this machinery.
- Maintenance schedule / Programmes: Preventive Maintenance, Stoppages, Breakdown Maintenance, Calibration System (if required).
- Plant Utilities: Own source of water or else, Water reservoir, Boiler, DM Plant, Electricity, Power, Compressor, Air Conditioning, and Effluent Treatment Plant.
- The energy requirements of the company (machinery, lighting, heating and or air conditioning): Sources, Connected load, Sur-plus electricity, Correlate items that can reveal major outcomes, e.g. how power factor in electricity bill reveals production rate.
- The use of computers / level of automation in the company: Process automation, Type of Instrumentation and Control, Fully / partially Automated, Office Automation, Value and system analysis.
- Quality Control: Quality policy, Accreditation, Quality measures.
- Safety and hygiene: Environmental norms, Fire Safety norms, Industrial Safety norms.
- Organization Chart/Structure: The organization of work.
- Man Power: Technical, Non-Technical, Administrative, Direct Employment, Indirect employment, Turnover-capital employment.
- Customer: market of finished product, Demand and Supply of product, Export, Any other information which you feel relevant for your study viz. Purchasing, Write-off policy, Inventory Control, Competitors, Export achievements, Building and Construction, Budgetary provisions, Control and cost analysis, Budgets/project planning/Scheduling etc.
- What do you think could be done in the particular areas you are working?
  - To improve communication?
  - To increase competitiveness of the firm?
  - To encourage good process/Design?
  - To improve standards of quality?
  - To improve energy saving?
- Continually ask following questions:-
  - How can one? Innovate, Eliminate, Combine, Standardize, Transfer, Modify and Simplify.
  - Always remember that an engineer is essentially a creator and innovator.
  - He should possess inquisitive mind.
  - He must use the words ‘How? When? Why?’ to understand dependence of men, machines, materials and money on each other.

GUIDELINES FOR IN-PLANT TRAINING REPORT

In addition to work diary (A-4 size register), you are required to submit an In-Plant Training Report along with details of organization / factory, where you have received training. You have to submit detailed report of training in the Industry incorporating study of plant / project / process along with intensive in-depth study on any one of the topics such as,

1. Process
2. Methods
3. Tooling
4. Equipments etc., highlighting aspects of quality, productivity and system.

Student should take notes throughout his training period and prepare a frame work in consultation with factory.

The report should be presented in the following manner.

1. Certification.
2. Index.
3. Introduction (Report).
4. Company background-organization and activities.
5. Scope and object of the study /Personal observations.
6. Result / Inference / Conclusion.
7. Suggestions / Recommendations for improvement / enhancement to industry, if any.
8. Acknowledgements.
9. List of reference (Library books, magazines and other sources).

Guidelines for evaluation / assessment of the report

1. Introduction, Company background activities, Acknowledgements, references.
2. Observations, Information collection, Liabilities, discharged by Chief / Shift Chemist and actual work done.
3. General presentation, neatness, and accuracy of the data furnished.
4. Report contents, with data, graphs, drawings etc. and observations.
5. Result / Inference / Conclusion.

Form No. 1

JOINING REPORT

Date:

To,

The Principal,

Government Polytechnic,

Kolhapur.

Respected Sir / Madam,

As per your instructions, I have reported myself for the In-Plant Training in_____

_____

On Date at _____AM / PM.

Yours Obediently,

Signature and name of Student

Course and Roll No.:

Countersigned by Time Office/

Signature of the Officer/Competent Authority of the Industry

Name and Seal of the Organization

*Every Student should submit one Photostat copy of this form to the Head of Department of Sugar Technology, Government Polytechnic, Kolhapur Immediately after joining the allotted Industry else his/ her term will not be granted.

Form No. 2

IN-PLANT TRAINING PROGRESS REPORT

Name of the Student_____Roll No._____

Course: - Final Year Diploma In Sugar Manufacturing Academic Year:

Name of Department / Plant Section: _____

Week No.	Date (From-To)		Brief Weekly Report about the work done and observation made.	Remark / Sign of Officer / Faculty

N.B.: Additional information, if any, may please be written on separate sheet.

Assessment / Remarks of the Training Officer / Faculty on the basis of work performed by Trainee:					
Criteria	Attendance	Conduct /Discipline	Progress	Motivation / Involvement	Cooperation
Grade					

Grade assigned: A = Excellent, B = Good, C = Fair, D = Average, E = Poor

Signature of the Student Signature of the Officer Signature of the Faculty

Form No. 2

IN-PLANT TRAINING PROGRESS REPORT

(The form is designed to bridge the gap for academic evaluation and improvement of skill of trainee)

Record of Progress of Trainee

Name of the Trainee: _____

Date of Commencement: _____ / _____ / _____

Progress Report for the Period: ___ / ____ / ____ To ____ / _____ / _____

Your opinion (Please tick the grade):

Sr. no.	Parameter	Grades			
		Excellent	Good	Fair	Average
1	Technical Knowledge				
2	Commitment				
3	Willingness to learn				
4	Hardworking				
5	Communication Skills				
6	Positive Attitude				
7	Obedience				
8	Sincerity				
9	Team Spirit				
10	Leadership				

Suggestions, if any:

• To inculcate any specific industry oriented Skills /For effective implementation of training:

_____

_____

_____

_____

Signature of Managing Director / Executive/Chief Officer of Industry /In-charge of Training

Name: Name:

Seal of the Industry / Organization

Form No. 4

IN-PLANT TRAINING REPORT FORMAT

1. The In-Plant Training Report shall be typed on A-4 size white bond paper.
2. Typing shall be with spacing of 1.5 or 2.0 using black ribbon or carbon on one side of the paper.
3. Margins: - (i) Left 37.5 mm. (ii) Right, top and bottom 25 mm.
4. Binding :- Hard with golden embossing on the front cover of brown colour
5. Front cover of hard bound report: - It should be identical to first title page.
6. Format for title page (First Page) (Centre justified) (Default font size TNR-12)
7. Format for Certification page (Second page)
8. The third page will be certificate issued by the industry regarding the completion of training.
9. The fourth page would be for acknowledgement, which would be followed by index page (Fifth page).
10. Sketches should be drawn on separate sheet (minimum A4 size) and be inserted at proper places. The sketches should be drawn in black ink and be numbered.
11. Tables should preferably be typed in the text only.
12. The mathematical symbol should be typed or neatly written so as to match darkness of the text.
13. The last item on the index should be references.
14. Students who have undergone In-Plant Training in more than one industry can bind the report as a single copy and will attach certificate of each industry in chronological order.
15. Page number must appear on the right hand top corner of each page starting after index page.
16. The contents of the seminar can be decided by the internal guide / department and student.
17. Minimum number of copies = 5 Copies (Central Library + Department + Internal Guide + External Guide + Student). The copy of External Guide (Industry Guide) will be submitted by the student after completion of training. The number of copies to external guide will be proportionate to the number of industries where he/she has undergone In- Plant Training.

Project Report of In-Plant Training
(TNR-14, Bold)
In
{Title of Sugar Industry}(TNR-18, Bold)
Submitted By
{Name of student}(TNR-16, Bold)

As a part of Curriculum of (TNR-12, Bold)
Diploma In Sugar Manufacturing (TNR-14, Bold)
Of
Department of Sugar Technology, (TNR-14, Bold)
Government Polytechnic (TNR-16, Bold)
Kolhapur (TNR-14, Bold)

Form No. 5

IN PLANT TRAINING COMPLETION CERTIFICATE

CERTIFICATE

This is to certify that Mr/Ms (Name of Student)

(Roll No: __)

final year student of Diploma in Sugar Manufacturing Programme

has successfully completed In-plant Training in our Industry

from period / / to / /

as per request of Principal of Government Polytechnic, Kolhapur

as a part of Curriculum of

Diploma In Sugar Manufacturing.

Signature of Managing Director / Executive/Chief Officer of Industry

Seal of the Industry / Organization

CERTIFICATE

This is to certify that Mr/Ms (Name of Student) (Roll No: __)

Final year student of Diploma in Sugar Manufacturing Programme

has submitted the Project Report based on In-plant Training in fulfillment final term of

Diploma in Sugar Manufacturing.

Name and Signature of

Faculty In-charge

Internal Examiner/External Examiner

Head of Department

Principal of Government Polytechnic, Kolhapur.

UNDERTAKING

(Third Year, Even Term: 201 – 201)

To,
The Principal,
Government Polytechnic,
Kolhapur.

Sub: - **SUGAR INDUSTRY IN-PLANT TRAINING (CODE: SIT: SMF 502)**

Respected Sir,

As a part of curriculum of Course Sugar Industry In-plant Training and code SMF 502 of Diploma In Sugar Manufacturing Programme run by Department of Sugar Technology at Government Polytechnic, Kolhapur, I have to undergo In-plant Training for Third Even Term: 201 – 201 (Final Year) of DSM from /12/201 to /04/201 (minimum 16 weeks) in the Sugar Industry allotted to me / preferred by me.

During In-plant Training in the Sugar Industry allotted to me / chosen by me, I undertake to follow rules and regulations stated below:

1. I hereby undertake to get insured by taking Accidental Insurance Policy before joining the In-plant Training.
2. I will submit a joining report through / duly countersigned by the Officer of the Organization where I am assigned to undergo In-plant Training.
3. I will be entirely under the disciplinary control of the organization where I am placed and will Abide by the rules and regulations of the said organization.
4. I will be entitled for leave during training period as per rules laid down by the organization. Before proceeding on leave I will take prior permission from the concerned authorities.
5. I will submit timely all the reports duly filled in and countersigned by the Officer of the Organization to the institute as per requirement.
6. I am aware that my Third Even Term: 201 - 201 of DSM will be granted if and only if:
    a) I attend training in allotted Sugar Industry on their all working days. (16 weeks.)
    b) I Undergo training to the satisfaction of In-charge officers of Sugar Industry and faculty of the Department from Institute
    c) On successful completion of training.
7. I hereby undertake that, the Institute or the Sugar Industry where I am assigned/ allowed to undergo In-plant Training will not be responsible for any mishap / accident during the training period/ during travel from living place to Industry and also for my any act contrary to law if any.
8. I assure that I will read and obey all the rules and regulations of the organization / manual available / as mentioned / as Directed by concerned authorities of the Organization.
9. I will obey and follow the stipulated term of training programme and all the instructions and guidelines mentioned in In-Plant Training Questionnaire provided by Department of Sugar Technology at G. P. Kolhapur.

Yours faithfully,

Date:
Place: Signature:

Class: DSM Final Year Roll No: Name:
Contact No.: E-mail id:

Address for Correspondence:

Signed before In-plant Training Coordinator/Faculty/Head of Department.