



# **GOVERNMENT POLYTECHNIC, KOLHAPUR**

(An Autonomous Institute of Government of Maharashtra)

*Curriculum Document*

**CURRICULUM: MPECS-2016**

**(Outcome Based Curriculum)**

for

**DIPLOMA IN ELECTRICAL ENGINEERING**

**Secretary**

**Chairman**

Programmewise Board of Studies (PBOS)  
Electrical Engineering Programme  
Government Polytechnic, Kolhapur

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# **SECTION – I**

## **CURRICULUM PHILOSOPHY AND STRUCTURE**

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

## **Curriculum Design and Development:**

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

## **Curriculum philosophy:**

The 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 to undertake 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 engineering concepts and multi capabilities within the students to make them model technicians.

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

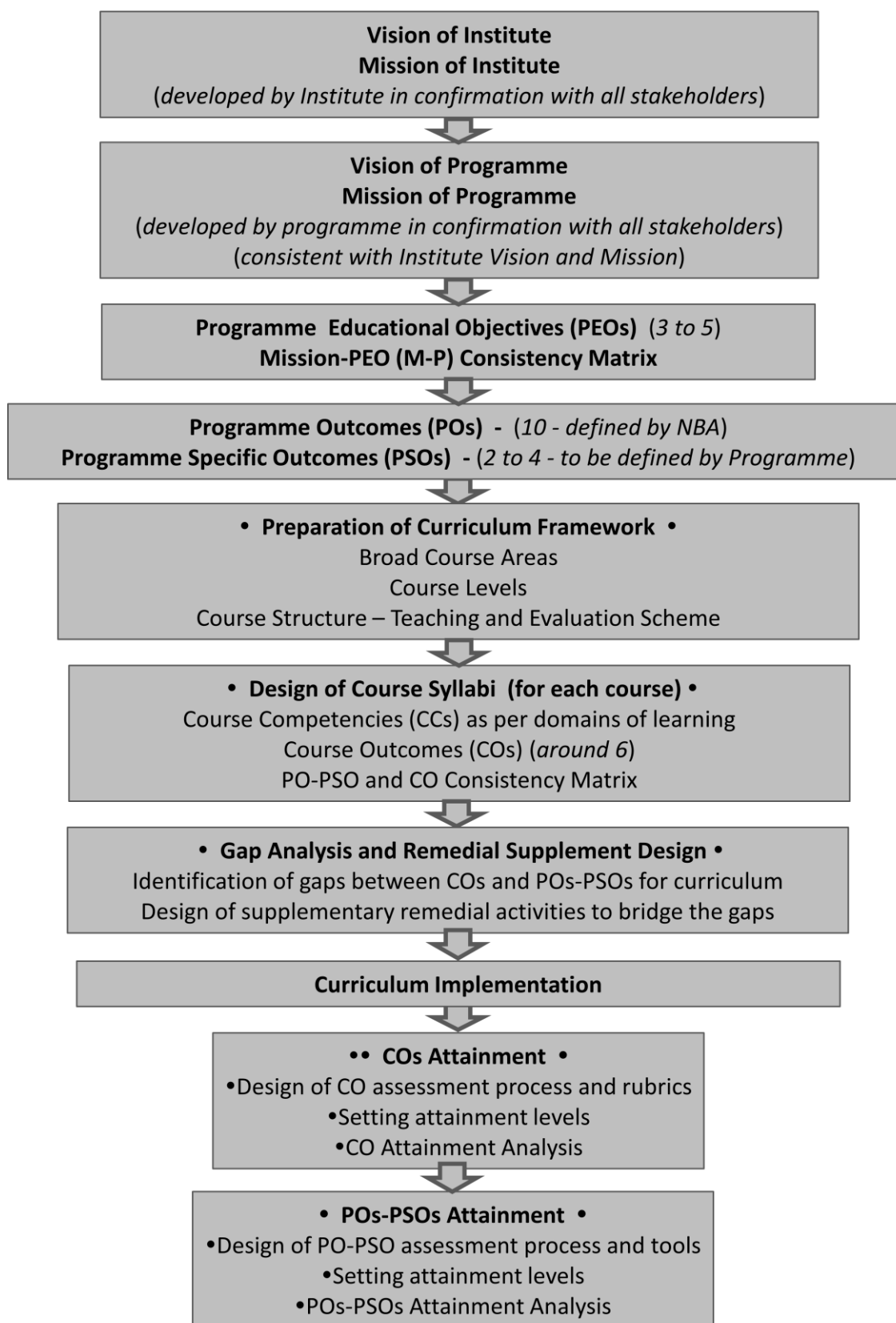
Hence, in a broad sense, a curriculum incorporates the following :

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

**Outcome-based Curriculum**

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

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

**OUTCOME BASED EDUCATION SYSTEM**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Course Outcomes (COs)** – It a set of about 6 outcomes, expected to be attained by student on learning a course. Course Outcomes shall be defined in curriculum for each course. Course

outcomes are worded using action verbs like solve, explain, calculate, compare, distinguish, describe, draw, etc.

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

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

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

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

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

*Remembering > Understanding > Applying > Analyzing > Evaluating > Creating*

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

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

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

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

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

*Receiving > Responding > Valuing > Organizing > Characterizing*

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

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

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

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

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

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



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

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

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

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

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

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

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

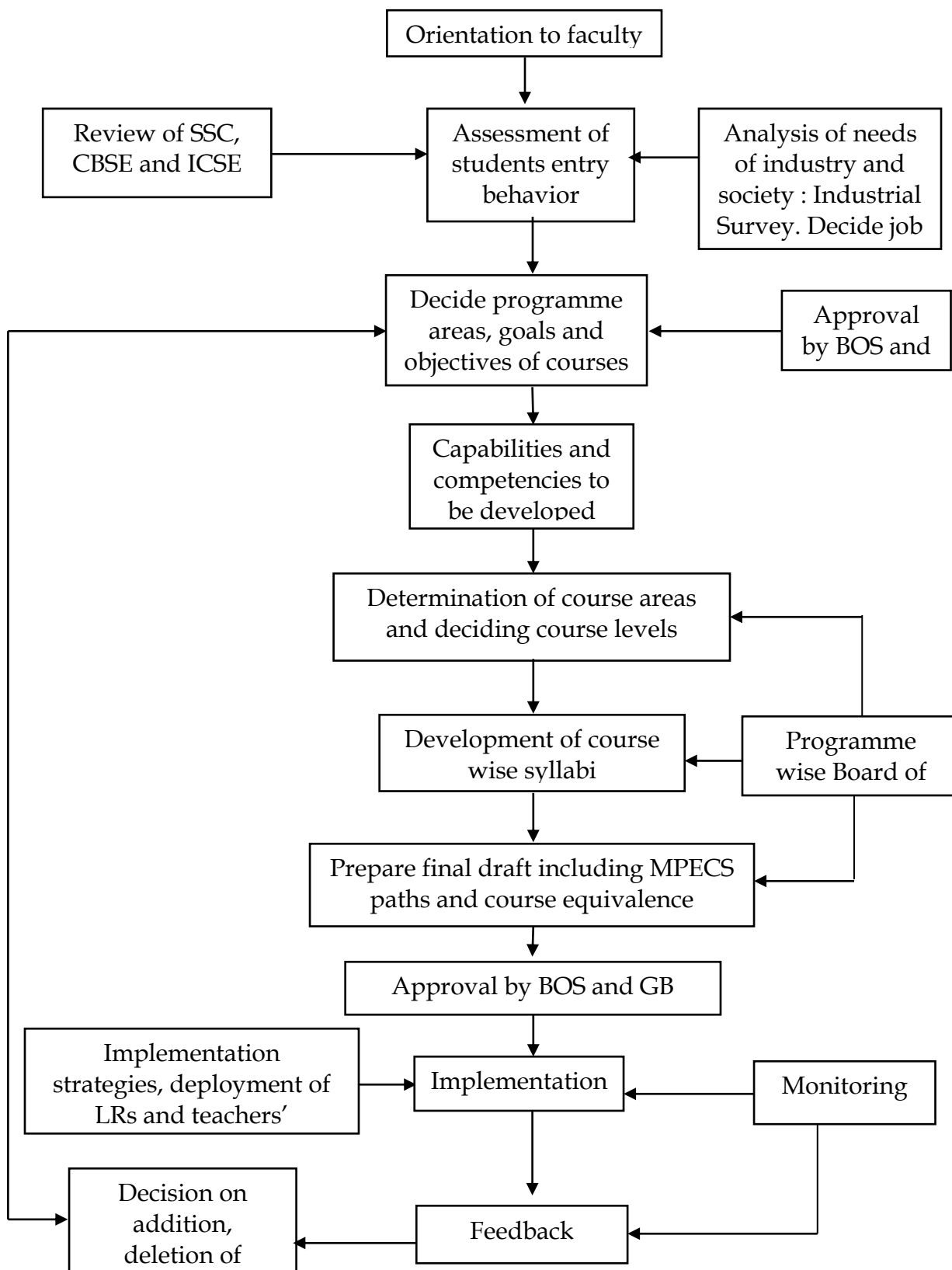
**Programme Department**– It is the department of the Institute offering Diploma in a particular Programme. e.g. Civil Engineering Department, Mechanical Engineering Department, etc.

**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 :**

# 1. 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 competent technicians and skilled manpower for industrial needs
- To ensure employability, encourage entrepreneurship, promote lifelong learning
- To inculcate in 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 and high recognition.

## Vision of department:

Skilled technicians serving the industry/society as entrepreneurs or rendering services in the fields related to electrical engineering following professional and ethical practices.

## Mission of programme department:

- 1) Provide quality innovative skilled based electrical engineering courses.
- 2) Prepare technicians for the state of art technology by promoting lifelong learning, technical expertise, ethical standards, and leadership qualities,
- 3) Commit our faculty expertise and modern facilities to the industry, the profession, and the local constituents..

## Programme vision supports the Institute vision as below:

S N	Key points of Institute Vision	Key points of Programme Vision	Remarks
1.	High recognition	Skilled technicians serving the industry/society.	Programme vision supports all the key points of the Institute vision as per the different supporting matching phrases shown beside.
2.	Competent technicians	Skilled technicians.	
3.	Quality services	Rendering services in the fields related to electrical engineering following professional and ethical practices.	
4.	Entrepreneurship	Entrepreneurs in the fields related to electrical engineering following professional and ethical practices.	
5.	Industry needs	Rendering services in the fields related to electrical engineering following professional and ethical practices.	
6.	Society	Following professional and ethical practices.	

**Programme Educational Objectives (PEOs):**

- 1) Provide responsible and environment friendly solutions to electrical engineering based problems in professionally ethical manner.
- 2) Use prevailing electrical engineering based technologies to solve multi-disciplinary problems.
- 3) Contribute as an individual or as a team member by communicating effectively to solve relevant problems.

**Program Outcomes:**

- 1) Use the knowledge of basic mathematics, science and engineering to solve general electrical engineering problems.
- 2) Apply the knowledge of electrical engineering to solve related problems.
- 3) Plan and perform experiments in electrical engineering whose results will be used to solve broad based electrical engineering problems.
- 4) Apply appropriate electrical engineering based technologies and tools keeping in mind their limitations.
- 5) Use the knowledge of electrical engineering to assess societal, health, legal and cultural issues and consequent responsibilities there in.
- 6) Provide wherever possible electrical engineering based technologies solutions for sustainable development practices in societal and environmental contexts.
- 7) Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of electrical engineering.
- 8) Work effectively as a individual leader and team member in diverse or multidisciplinary environment.
- 9) Communicate with all concerned using the available channels in an effective manner.
- 10) Recognizing the need and the preparation required for independent and lifelong learning of the ever-changing technologies will adapt the appropriate approach.

**Programme Specific Outcomes (PSO's):**

- 1) Maintain various types of electrical equipments.
- 2) Maintain various sections of electrical power systems.

## 2. OVERVIEW AND SALIENT FEATURES OF CURRICULUM : MPECS-2016

### 2.1 Overview of Curriculum MPECS-2016

Total No. of Credits		180
No. of courses offered	Total	38
	Theory	35
Max. no. courses in a semester		7
Total Maximum Marks		4400
Courses in Level IV and V	No.	14
	Credits	68
	Marks	1600
Courses in Level I	No.	09
	Credits	44
	Marks	975
Courses in Level II	No.	03
	Credits	11
	Marks	225
Courses in Level III	No.	12
	Credits	57
	Marks	1600
Courses in Level IV	No.	7
	Credits	35
	Marks	800
Courses in Level V	No.	07
	Credits	33
	Marks	800
%Ratio of Th:Pr	Marks-wise	1.9
	Credit-wise	1.25
No. of Allied Courses		5
Optional Courses	No. of courses	3
	Options/course	1/3, 1/3, 1/5.
No. of Practical Exams	Internal	10
	External	7
No. of Orals	Internal	2
	External	4

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

### **3.1 Salient Features of Curriculum MPECS-2016**

The curriculum is outcome based and has been reinforced with some new courses while obsolete contents of courses have been replaced with the state of art contents.

#### **Addition and deletion of Courses with respect to MPECS-2013 :**

- a) Course Basic Mechanical and Civil Engineering has been added while the course Basic Mechanical Engineering has been removed.
- b) The course on Advanced Solar and Wind Power Technologies has been added.
- c) The course Elements of Industrial Automation has been added as elective.
- d) The course Microprocessor and Microcontrollers has been replaced by Microcontrollers (as Microprocessors are now out dated).
- e) Course of environmental studies has been deleted as its contents are spread out in the other courses.

#### **Major modifications in Course Contents with respect to MPECS-2013:**

- a) Contents of Energy Conservation and Audit have been modified as per the directives of Maharashtra Energy Development Authority and Maharashtra State Board of Technical Education.
- b) Course of Electrical Measurements and Instrumentation is weighted more with solid state measuring instruments.
- c) The contents of course Microprocessor and Microcontrollers has been replaced by contents on Microcontrollers only as Microprocessors are out dated.

#### **Changes in Implementation Strategy and Treatment with respect to MPECS-2013:**

- a) The teaching learning process of the courses will be supported by extra micro/mini projects where ever needed.
- b) The assessment of industrial trainings at the end of fourth and fifth semesters will be done along with the assessment of Seminar and Project courses.

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

- 1. Industrial training of four weeks after fourth semester and two weeks after fifth semester is mandatory.
- 2. It has been framed on the basis of industry required outcomes related to each course (outcome based).

**2.2 TEACHING AND EXAMINATION SCHEME (LEVEL-WISE)**

S.No.		Course Code	Course Abr.	Level	Pre-requisite	T H	T U	P R	Credits	TH	TS	T W	PR	OR
<b>LEVEL-1: FOUNDATION COURSES</b>														
1	Engineering Physics	CCF102	FPHB	1		4		2	6	80	20		50 I	
2	Chemistry of Engineering materials	CCF104	FCHB	1		4		2	6	80	20		50 I	
3	Basic Mathematics	CCF105	FBMT	1		3	1		4	80	20			
4	Engineering Mathematics	CCF106	FEMT	1	CCF105	3	1		4	80	20			
5	Engineering Graphics	CCF109	FEGR	1		2		4	6			25	50 E	
6	Applied Mechanics	CCF110	FAPM	1		4		2	6	80	20	25		
7	Computer Fundamentals	EEF101	FCFA	1		2		2	4	40	10	25		
8	Fundamentals of Electricity & Magnetism	EEF102	FFEM	1		4		2	6	80	20		50 I	
9	Workshop Practice	EEF103	FEWS	1				2	2			50		
<b>LEVEL-2 : LIFE &amp; PROFESSIONAL SKILL COURSES</b>						<b>TOTAL</b>	<b>26</b>	<b>2</b>	<b>16</b>	<b>44</b>	<b>520</b>	<b>130</b>	<b>125</b>	<b>200</b>
1	Generic Skills	CCF201	FGNS	2		2		2	4			25	50 I	
2	Communication Skills	CCF202	FCMS	2		2		2	4	50			25 I	
3	Professional Practices	CCF203	FPRP	2		1		2	3			25	50I	
<b>LEVEL- 3BASIC TECHNOLOGY COURSES</b>						<b>TOTAL</b>	<b>05</b>	<b>06</b>	<b>11</b>	<b>50</b>		<b>50</b>	<b>125</b>	
1	Applied Mathematics	EEF301	FAMT	3	CCF106	3	1		4	80	20			
2	Electric Circuits	EEF302	FECT	3	EEF102	3	1	2	6	80	20	25	50E	
3	Basic Electronics	EEF303	FBET	3		3		2	5	80	20	25		
4	Electrical Measurement & Instrumentation	EEF304	FEMI	3	EEF102	3		2	5	80	20	25	25I	
5	Electrical Materials, Wiring and Illumination	EEF305	FMWI	3	EEF102	3		2	5	80	20	25		25I
6	Electrical Power Generation	EEF306	FEPG	3	EEF102	3	1		4	80	20	25		25I
7	DC Machines & Transformers	EEF307	FDMT	3	EEF102	3		2	5	80	20	25	50E	
8	CAD & Electrical Drawing.	EEF308	FCAD	3		1		2	3			50	25I	
9	Applied Electronics	EEF309	FAET	3	EEF303	3		2	5	80	20	25	50I	
10	Transmission & Distribution of Electric Power	EEF310	FTDP	3	EEF306	3	1	2	6	80	20	25		
11	Entrepreneurship Dev. & Tech. Writing	EEF311	FEDW	3		1		2	3			50	25I	
12	Basic Mechanical & Civil Engineering	EEF312	FBMC	3		4		2	6	80	20	25		
<b>LEVEL- 4APPLIED TECHNOLOGY COURSES</b>						<b>TOTAL</b>	<b>33</b>	<b>4</b>	<b>20</b>	<b>57</b>	<b>800</b>	<b>200</b>	<b>325</b>	<b>225</b>
1	Electrical Estimation and contracting.	EEF401	FEEC	4		3		2	5	80	20	25		25E
2	AC Rotating Machines	EEF402	FACM	4	EEF302	3	1	2	6	80	20		25E	
3	Switchgear & Protection	EEF403	FSWP	4	EEF302	3	1	2	6	80	20			25E
4	Electric power Utilization & Traction	EEF404	FEUT	4	EEF302	3	1	2	6	80	20	25		
5	Energy Conservation & Audit	EEF405	FECA	4		3		2	5	80	20	25		
6	Power Electronics	EEF406	FPET	4	EEF309	3		2	5	80	20		25E	
7	Seminar	EEF407	FSMR	4				2	2			25		
<b>LEVEL- 5 DIVERSIFIED TECHNOLOGY COURSES</b>						<b>TOTAL</b>	<b>18</b>	<b>3</b>	<b>14</b>	<b>35</b>	<b>480</b>	<b>120</b>	<b>100</b>	<b>50</b>
1	Testing & Maintenance of Elect. Equipments	EEF501	FTME	5	EEF307 EEF402	3	1	2	6	80	20		25E	
2	Electrical Machine Control & Automation	EEF502	FMCA	5	EEF307 EEF402	3		2	5	80	20			25E
3	Project	EEF503	FPRJ	5		0		4	4			25		50E
4	Micro-controllers	EEF504	FMCS	5	EEF406	3		2	5	80	20		25E	
5	Elective-I ( Management course)	EEF513/514 /515		5		3			3	80	20			
6	Elective-II (Any one)	EEF- 505/506 /507		5		3		2	5	80	20	25		
7	Elective-II I (Any one)	EEF- 508/509 /510/511/512		5		3		2	5	80	20	25		
<b>TOTAL</b>						<b>18</b>	<b>1</b>	<b>14</b>	<b>33</b>	<b>480</b>	<b>120</b>	<b>75</b>	<b>50</b>	<b>75</b>

### Optional Courses for Electives

<b>ELECTIVES</b>													
<b>ELECTIVE-I(Any One)</b>	Course code	Course abbr	level	Pre-requisite	TH	TU	PR	Credits	TH	TS	TW	PR	OR
1.Industrial Organisation and Management	EEF513	FIOM	5		3			3	80	20			
2.Marketing Management	EEF514	FMKM	5		3			3	80	20			
3.Project Management	EEF515	FPRM	5		3			3	80	20			
<b>Elective-II (Any one)</b>													
1. Electric Drives	EEF505	FELD	5	EEF307 EEF402	3		2	5	80	20	25		
2.Programmable Logic Controller	EEF506	FPLC	5	-	3		2	5	80	20	25		
3.Elements of Industrial Automation	EEF507	FEIA	5	EEF307 EEF402	3		2	5	80	20	25		
<b>Elective-III (Any one)</b>													
1.Non conventional Power Generation	EEF508	FNCG	5	EEF306	3		2	5	80	20	25		
2.Substation Practices & Maintenance	EEF509	FSPM	5	EEF403	3		2	5	80	20	25		
3. Advanced solar and wind power technologies	EEF510	FASW	5	EEF306	3		2	5	80	20	25		
4.Electrical design fundamentals.	EEF511	FEDF	5	EEF302	3		2	5	80	20	25		
5. Illumination Engineering.	EEF512	FILM	5	EEF305	3		2	5	80	20	25		

All pre-requisites are applicable to Xth path entrants. For direct second year entrants these will be as per their path shown.



## 2.3 PATH-WISE COURSE STRUCTURES

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

Sr no	SEMESTER -1	Course Code	Course Abr.	LEVEL	Pre-requisite	Teaching scheme			Credits	Evaluation scheme				
						TH	TU	PR		TH	TS	TW	PR	OR
1	Engineering Physics	CCF102	FPHB	1		4		2	6	80	20		50 I	
2	Basic Mathematics	CCF105	FBMT	1		3	1		4	80	20			
3	Engineering Graphics	CCF109	FEGR	1		2		4	6			25	50 E	
4	Applied Mechanics	CCF 110	FAPM	1		4		2	6	80	20	25		
5	Workshop Practice	EEF103	FEWS	1				2	2			50		
6	Generic Skills	CCF201	FGNS	2		2		2	4			25	50 I	
<b>TOTAL</b>						<b>15</b>	<b>1</b>	<b>12</b>	<b>28</b>	<b>240</b>	<b>60</b>	<b>125</b>	<b>150</b>	
<b>Sr no Semester -2</b>														
1	Chemistry of Engineering materials	CCF104	FCHB	1		4		2	6	80	20		50 I	
2	Engineering Mathematics	CCF106	FEMT	1	CCF105	3	1		4	80	20			
3	Communication Skills	CCF202	FCMS	2		2		2	4	50			25 I	
4	Computer Fundamentals	EEF101	FCFA	1		2		2	4	40	10	25		
5	Fundamentals of Electricity & Magnetism	EEF102	FFEM	1		4		2	6	80	20		50 I	
6	Basic Mechanical & Civil Engineering #	EEF312	FBMC	3		4		2	6	40+40	20	25		
# Section 1 & 2 answer books will be assessed separately.						<b>TOTAL</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>410</b>	<b>90</b>	<b>50</b>	<b>125</b>
<b>Sr no Semester 3</b>														
1	Applied Mathematics	EEF301	FAMT	3	CCF106	3	1		4	80	20			
2	Electric Circuits	EEF302	FECT	3	EEF102	3	1	2	6	80	20	25	50E	
3	Basic Electronics	EEF303	FBET	3		3		2	5	80	20	25		
4	Electrical Measurement & Instrumentation	EEF304	FEMI	3	EEF102	3		2	5	80	20	25	25I	
5	Electrical Materials, Wiring and Illumination	EEF305	FMWI	3	EEF102	3		2	5	80	20	25		25I
6	Electrical Power Generation	EEF306	FEPG	3	EEF102	3	1		4	80	20	25		25I
<b>TOTAL</b>						<b>18</b>	<b>3</b>	<b>8</b>	<b>29</b>	<b>480</b>	<b>120</b>	<b>125</b>	<b>75</b>	<b>50</b>
<b>Sr no Semester 4</b>														
1	Professional Practices	CCF203	FPRP	2		1		2	3			25	50 I	
2	DC Machines & Transformers	EEF307	FDMT	3	EEF102	3		2	5	80	20	25	50E	
3	CAD & Electrical Drawing.	EEF308	FCAD	3		1		2	3			50	25I	
4	Applied Electronics	EEF309	FAET	3	EEF303	3		2	5	80	20	25	50I	
5	Transmission and Distribution of Electric Power	EEF310	FTDP	3	EEF306	3	1	2	6	80	20	25		
6	Electrical Estimation and Contracting	EEF401	FEEC	4	EEF305	3		2	5	80	20	25		25E
<b>TOTAL</b>						<b>14</b>	<b>1</b>	<b>12</b>	<b>27</b>	<b>320</b>	<b>80</b>	<b>175</b>	<b>175</b>	<b>25</b>
<b>Sr no Semester 5</b>														
1	Entrepreneurship Dev. & Tech. Writing	EEF311	FEDW	3	-	1		2	3			50	25I	
2	AC Rotating Machines	EEF402	FACM	4	EEF302	3	1	2	6	80	20		25E	
3	Switchgear & Protection	EEF403	FSWP	4	EEF302	3	1	2	6	80	20			25E
4	Electric power Utilization & Traction	EEF404	FEUT	4	EEF302	3	1	2	6	80	20	25		
5	Energy Conservation & Audit	EEF405	FECA	4	-	3		2	5	80	20	25		
6	Power Electronics	EEF406	FPET	4	EEF309	3		2	5	80	20		25E	
7	Seminar	EEF407	FSMR	4				2	2			25		
<b>TOTAL</b>						<b>16</b>	<b>3</b>	<b>14</b>	<b>33</b>	<b>400</b>	<b>100</b>	<b>125</b>	<b>75</b>	<b>25</b>
<b>Sr no Semester 6</b>														
1	Elective-I ( Management course)	EEF 513 / 514/515		5	-	3			3	80	20			
2	Testing & Maintenance of Elect. Equipments	EEF501	FTME	5	EEF307, EEF402	3	1	2	6	80	20		25E	
3	Electrical Machine Control & Automation	EEF502	FMCA	5	EEF307 EEF402	3		2	5	80	20			25E

## Curriculum MPECS 2016 : Diploma in Electrical Engineering

4	Project	EEF503	FPRJ	5		0		4	4			25		50E
5	Micro-controllers	EEF504	FMCS	5	EEF406	3		2	5	80	20		25E	
6	Elective-II (Any one)	EEF-505/506/507		5		3		2	5	80	20	25		
7	Elective-II I (Any one)	EEF-508/509/510/511/512		5		3		2	5	80	20	25		
<b>TOTAL</b>						<b>18</b>	<b>1</b>	<b>14</b>	<b>33</b>	<b>480</b>	<b>120</b>	<b>75</b>	<b>50</b>	<b>75</b>

ELECTIVES	Course Code	Course Abr.	LEVE L	Pre-requisite	TH	TU	PR	Credits	TH	TS	TW	PR	OR
<b>ELECTIVE- I (Any One)</b>													
1.Industrial Organisation and Management	CCF501/EEF513	FIOM	5		3			3	80	20			
2.Marketing Management	EEF514	FMKM	5		3			3	80	20			
3.Project Management	EEF515	FPRM	5		3			3	80	20			
<b>Elective-II (Any one)</b>													
1.Electric drives	EEF505	FELD	5	EEF307 EEF402	3		2	5	80	20	25		
2.Programmable Logic Controller	EEF506	FPLC	5	-	3		2	5	80	20	25		
3.Elements of Industrial Automation	EEF507	FEIA	5	EEF307 EEF402	3		2	5	80	20	25		
<b>Elective-III (Any one)</b>													
1.Non conventional Power Generation	EEF508	FNCG	5	EEF306	3		2	5	80	20	25		
2.Substation Practices & Maintenance	EEF509	FSPM	5	EEF403	3		2	5	80	20	25		
3.Advanced solar and wind power technologies.	EEF510	FASW	5	EEF306	3		2	5	80	20	25		
4.Electrical design fundamentals.	EEF511	FEDF	5	EEF302	3		2	5	80	20	25		
5. Illumination Engineering.	EEF512	FILM	5	EEF305	3		2	5	80	20	25		

**Path-wise Course Structure**  
**Path-2: Students admitted directly to Second Year**

Sr no	Semester 3	Course Code	Course Abr.	LEVEL	Pre-requisite	Teaching scheme			Credits	Evaluation scheme				
						TH	TU	PR		TH	TS	TW	PR	OR
1	Applied Mathematics	EEF301	FAMT	3		3	1		4	80	20			
2	Electric Circuits	EEF302	FECT	3		3	1	2	6	80	20	25	50E	
3	Basic Electronics	EEF303	FBET	3		3		2	5	80	20	25		
4	Electrical Measurement & Instrumentation	EEF304	FEMI	3		3		2	5	80	20	25	25I	
5	Electrical Material & Wiring	EEF305	FEMW	3		3		2	5	80	20	25		25I
6	Electrical Power Generation	EEF306	FEPG	3		3	1		4	80	20	25		25I
					<b>TOTAL</b>	<b>18</b>	<b>3</b>	<b>8</b>	<b>29</b>	<b>480</b>	<b>120</b>	<b>125</b>	<b>75</b>	<b>50</b>
<b>Sr no</b>	<b>Semester 4</b>													
1	Professional Practices	CCF203	FPRP	2		1		2	3			25	50 I	
2	DC Machines & Transformers	EEF307	FDMT	3		3		2	5	80	20	25	50E	
3	CAD & Electrical Drawing.	EEF308	FCAD	3		1		2	3			50	25I	
4	Applied Electronics	EEF309	FAET	3	EEF303	3		2	5	80	20	25	50I	
5	Transmission and Distribution of Electric Power	EEF310	FTDP	3	EEF306	3		2	6	80	20	25		
6	Electrical Estimation and Contracting	EEF401	FEEC	4	EEF305	3		2	5	80	20	25		25E
					<b>TOTAL</b>	<b>14</b>		<b>12</b>	<b>27</b>	<b>320</b>	<b>80</b>	<b>175</b>	<b>175</b>	<b>25</b>
<b>Sr no</b>	<b>Semester 5</b>													
1	Entrepreneurship Dev. & Tech. Writing	EEF311	FEDW	3	-	1		2	3			50	25I	
2	AC Rotating Machines	EEF402	FACM	4	EEF302	3	1	2	6	80	20		25E	
3	Switchgear & Protection	EEF403	FSWP	4	EEF302	3	1	2	6	80	20			25
4	Electric power Utilization & Traction	EEF404	FEUT	4	EEF302	3	1	2	6	80	20	25		
5	Energy Conservation & Audit	EEF405	FECA	4	-	3		2	5	80	20	25		
6	Power Electronics	EEF406	FPET	4	EEF309	3		2	5	80	20		25E	
7	Seminar	EEF407	FSMR	4				2	2			25		
					<b>TOTAL</b>	<b>16</b>	<b>3</b>	<b>14</b>	<b>33</b>	<b>400</b>	<b>100</b>	<b>125</b>	<b>75</b>	<b>25</b>
<b>Sr no</b>	<b>Semester 6</b>													
1	Elective-I ( Management course)	EEF513/514/515		5		3			3	80	20			
2	Testing & Maintenance of Elect. Equipments	EEF501	FTME	5	EEF307 EEF402	3	1	2	6	80	20		25E	
3	Electrical Machine Control & Automation	EEF502	FMCA	5	EEF307 EEF402	3		2	5	80	20			25E
4	Project	EEF503	FPRJ	5	-	0		4	4			25		50E
5	Micro-controllers	EEF504	FMMC	5	EEF406	3		2	5	80	20		25 E	
6	Elective-II (Any one)	EEF-505/ 506/507		5		3		2	5	80	20	25		
7	Elective-II I (Any one)	EEF-508/ 509/510/511/512		5		3		2	5	80	20	25		
					<b>TOTAL</b>	<b>18</b>	<b>1</b>	<b>14</b>	<b>33</b>	<b>480</b>	<b>120</b>	<b>75</b>	<b>50</b>	<b>75</b>

ELECTIVES	Course Code	Course Abr.	LEVEL	Pre-requisite	TH	TU	PR	Credits	TH	TS	TW	PR	OR
<b>Elective- I (Any One)</b>													
1.Industrial Organisation and Management	CCF501/EEF513	FIOM	5		3			3	80	20			
2.Marketing Management	EEF514	FMKM	5		3			3	80	20			
3.Project Management	EEF515	FPRM	5		3			3	80	20			
<b>Elective-II (Any one)</b>													
1.Electric drives	EEF505	FELD	5	EEF307 EEF402	3		2	5	80	20	25		
2.Programmable Logic Controller	EEF506	FPLC	5	-	3		2	5	80	20	25		
3.Elements of Industrial Automation	EEF507	FEIA	5	EEF307 EEF402	3		2	5	80	20	25		
<b>Elective-III (Any one)</b>													
1.Non conventional Power Generation	EEF508	FNCG	5	EEF306	3		2	5	80	20	25		
2.Substation Practices & Maintenance	EEF509	FSPM	5	EEF403	3		2	5	80	20	25		
3. Advanced solar and wind power technologies.	EEF510	FASW	5	EEF306	3		2	5	80	20	25		
4. Electrical design fundamentals.	EEF511	FEDF	5	EEF302	3		2	5	80	20	25		
5. Illumination Engineering.	EEF512	FILM	5	EEF305	3		2	5	80	20	25		

## 6. EXEMPTIONS FOR COURSES

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

S N	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 Physics (EE/IE/ET/IT)	CCF102	YES	YES	YES	YES	YES
3	Engineering Chemistry (CE/ME/SM/MT)	CCF103	YES	YES	YES	YES	YES
4	Engineering Chemistry (EE/IE/ET/IT)	CCF104	YES	YES	YES	YES	YES
5	Basic Mathematics	CCF105	YES	YES	YES	YES	YES
6	Engineering Mathematics	CCF106	YES	YES	YES	YES	YES
7	Engineering Drawing -1 (CE/ME/MT)	CCF107	YES	YES	YES	YES	YES
8	Engineering Drawing-1(SM)	CCF117	YES	YES	YES	YES	YES
9	Engineering Drawing -2 (CE/ME/SM/MT)	CCF108	YES	YES	YES	YES	YES
10	Engineering Graphics (EE/IT/ IE/ET)	CCF109	YES	YES	YES	YES	YES
11	Applied Mechanics	CCF110	YES	YES	YES	YES	YES
12	Workshop Practices-1 (CE)	CCF111	YES	YES	YES	YES	YES
13	Workshop Practices-1 (ME, SM, MT)	CCF112	YES	YES	YES	YES	YES
14	Workshop Practices (EE)	CCF113	YES	YES	YES	YES	YES
15	Workshop Practices (IE, ET)	CCF114	YES	YES	YES	YES	YES
16	Workshop Practices -2 (CE)	CCF115	YES	YES	YES	YES	YES
17	Workshop Practices -2 (ME, SM, MT)	CCF116	YES	YES	YES	YES	YES
18	Generic Skills	CCF201	YES	YES	YES	YES	YES
19	Communication Skills	CCF202	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 he has passed.

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

**As per MSBTE's circular no backlog for lateral entry to second year**

**7. COURSE EQUIVALENCE FOR PREVIOUS MPECS**

MPECS 1994	MPECS 2001	MPECS 2006	MPECS 2010	MPECS 2013	MPECS 2016
		R 101 Generic Skills	X 101 Generic Skills	CCE201 Generic Skills	CCF 201 Generic Skills
101 Communication Skill – I	0101 Communication Skill - I	R 102 Communication Skills.	X106 Communication Skills	CCE202 Communication Skills	CCF202 Communication Skills
102 Communication Skill – II	0102 Communication Skill - II	R 102 Communication Skills.	X106 Communication Skills	CCE202 Communication Skills	CCF202 Communication Skills
103 Applied Physics	0103 Applied Physics - I 0104 Applied Physics - II	R 103 Applied Physics - I R 104 Applied Physics - II	X 102 Basic Physics X 108 Applied Physics	CCE102 Engineering Physics	CCF102 Engineering Physics
104 Applied Chemistry	0105 Applied Chemistry - I 0106 Applied Chemistry - II	R 105 Applied Chemistry. R 106 Chemistry of Engineering Materials.	X 103 Applied Chemistry X109 Chemistry of Engineering Materials	CCE104 Engineering Chemistry	CCF104 Engineering Chemistry
105 Mathematics –I	0107 Mathematics - I	R 107 Basic Mathematics.	X 104 Basic Mathematics	CCE105 Basic Mathematics	CCF105 Basic Mathematics
106 Mathematics - II	0108 Mathematics - II	R 108 Engineering Mathematics	X 110 Engineering Mathematics	CCE106 Engineering Mathematics	CCF106 Engineering Mathematics
107 Applied Mechanics I	0116 Applied Mechanics	R 112 Applied Mechanics	X 111 Applied Mechanics	CCE110 Applied Mechanics	CCF110 Applied Mechanics
108 Introduction to Computer	0115 Introduction to Computer	R 111 Computer Fundamentals & Applications	--	EEE301 Computer Fundamentals	EEF101 Fundamentals Computer Hardware & software
109 Engineering Drawing - I	0109 Engineering Drawing - I	R 109 Engineering Drawing - I	X 105 Engineering Drawing- I	CCE109 Engineering Graphics	CCF109 Engineering Graphics
110 Engineering Drawing - II	0110 Engineering Drawing - II	R 110 Engineering Drawing - II	X 107 Engineering Drawing- II	CCE109 Engineering Graphics	CCF109 Engineering Graphics
111 Workshop -I	0113 Workshop - I	R 113 Workshop Practice - I	EE 101 Basic Workshop Practice (Electrical)	CCE113 Workshop Practice	CCF113 Workshop Practice
112 Workshop - II	0114 Workshop - II	R 114 Workshop Practice - II	EE 102 Workshop Practice (Electrical)	CCE113 Workshop Practice	CCF113 Workshop Practice
NIL	0111 Fundamentals of Engineering – I.	NIL	NIL	NIL	NIL
NIL	0112 Fundamentals of Engineering – II.	NIL	NIL	NIL	NIL
201 Mathematics III	0201 Applied Mathematics	E 201 Applied Mathematics	EE 201 Applied Engg. Mathematics	EEE305 Applied Mathematics	EEF301 Applied Mathematics
E 202 Electrical Engineering - I	3202 D.C Circuits	E 202 D.C Circuits	EE 202 D. C. Circuits	EEE102 Fundamentals of Electrical Engineering EEE307 D.C. and A.C.Circuits	EEF102 Fundamentals of Electricity, and Magnetism EEF302 Electric circuits
E 203 Electrical Engineering - II	3203 A.C Circuits	E 203 A.C Circuits	EE 203 A. C. circuits	EEE307 D.C. and A.C.Circuits	EEF302 Electric circuits
E 204 Electrical Measurements – I	3204 Basic Measurements Theory	E 204 Basic Measurements Theory	EE 204 Electrical Measurement	EEE306 Electrical Measurement	EEF304 Electrical Measurement & Instrumentation

MPECS 1994	MPECS 2001	MPECS 2006	MPECS 2010	MPECS 2013	MPECS 2016
E 205 Electrical Measurements – II	3205 Measurement of Power & Energy	E205Electricalmeasurements and Instrumentation	EE 205 Electrical Instrumentation.	EEE310 Electrical Instrumentation)	EEF304Electrical Measurement & Instrumentation
E 206 Electronics	3206 Fundamentals of Electronics	E 206 Fundamentals of Electronics	EE 206 Fundamentals of Electronics	EEE201 Fundamentals of Electronics	EEF303 Basic Electronics
E 207 Electrical Machines - I	3207 D.C.Machines & Syn.Machines	E 207 D. C. Machines & Syn. Machines	EE 207 D. C. Machines & Syn. Machines	EEE302 D.C .Machines and Transformers EEE401 A.C. Machines	EEF307 D.C. Machines and Transformers EEF402 AC Rotating Machines
E 208 Electrical Machines - II	3207 D.C.Machines & Syn.Machines 3208 Transformer & Induction Motor	E 208 Transformers.	EE208 Transformers.	EEE302 D.C. Machines and Transformers	EEF307 D.C. Machines and Transformers
E 209 Transformers	3208 Transformer & Induction Motor	E 209 Induction Motors	EE209 Induction Machines	EEE401 A.C. Machines	EEF402 AC Rotating Machines
	3209 Development of Soft Skills	E 210 Personality Development.	EE 210 Personality Development	NIL	Nil
E301 Electrical Power -I	3301 Generation & Transmission	E 301 Generation & Transmission	EE 211 Generation & Transmission	EEE303 Generation and Transmission	EEF306 Electrical power generation, EEF310 Transmission and distribution of electric power
E 302 Electrical Power - II	3302 Economics & Distribution of Electrical Energy	E 302 Economics & Distribution of Electrical Energy	EE 212 Economics & Distribution of Electrical Energy	EEE403 Distribution and Utilisation	EEF310 Transmission and distribution of electric power EEF404 Electric power utilization and traction
221 Basic Civil Engineering	0221 Elements of Civil Engineering	R 221 Elements of Civil Engineering	-	-	EEF312 Basic Mechanical & Civil Engineering
222 Basic Electrical engineering	0222 Electric circuits & Machines	R 222 Electrical Wiring & Estimating	-	-	-
223 Basic Electronics	0223 Basic Electronics	R 223 Basic Electronics	-	-	-
224 Basic Mechanical Engineering	0224 Basic Mechanical & Maintenance Engineering	R 224 Basic Mechanical & Maintenance Engineering	-	EEE101 Basic Mechanical Engineering	EEF312 Basic Mechanical & Civil Engineering
225 Basic Sugar Manufacturing	0225 Basic Sugar Manufacturing	R 225 Basic Sugar Manufacturing	-	-	-
226 Pollution Control	0226 Pollution Control	R 226 Pollution Control	-	-	-
227 Non-Conventional Energy Sources	0227 Non-Conventional Energy Sources	R 227 Non-Conventional Energy Sources	-	EEE311 Non Conventional Energy Sources	EEF508 .Non conventional Power Generation

MPECS 1994	MPECS 2001	MPECS 2006	MPECS 2010	MPECS 2013	MPECS 2016
E.406 Project Management	3406 Project Management	E 408 Project Management.	EE 408 Project Management.	EEE512 Project Management	EEF515Project Management
E 407 Electrical Protection	3407 Protection of Electrical Equipment	E 409 Protection of Electrical Equipment	EE 409 Protection of Electrical Equipment	EEE406 Switchgear and Protection	EEF403 Switchgear and Protection
E 408 Power Electronics	3408 Power Electronics	E 410 Power Electronics	EE 410 Power Electronics	EEE501 Power Electronics	EEF406 Power Electronics
E 409 Electrical Estimation & Costing	3409 Electrical Estimation & Contracting	E 411 Electrical Estimation & Contracting	EE 411 Electrical Estimation & Contracting	EEE402 Electrical Estimation and Costing	EEF401 Electrical Estimation and Contracting
E 411 Electrical Power Station & Substation Practice	3410 Electrical Power Station & Substation Practice	E 412 Electrical Power Station & Substation Practice	EE 412 Electrical Power Station & Substation Practice	NIL	EEF 509 Substation Practices & maintenance
E 412 Electrical Maintenance	3411 Maintenance of Electrical Equipment	E 413 Maintenance of Electrical Equipment	EE 413 Installation and Maintenance of Electrical Equipment	EEE405 Testing and Maintenance of Electrical Equipments	EEF501 Testing and Maintenance of Electrical Equipments
E 413 Power System Analysis	3412 Power System Analysis	E 414 Power System Analysis	EE 414 Power system Analysis	NIL	NIL
E 414 Traction and drives	3413 Electrical Traction & Drives	E 415 Electrical Traction & Drives	EE 415 Electric Traction & Drives	EEE508 Electric Traction	EEF404 Electric power Utilization & Traction
NIL	NIL	NIL	NIL	CCE203 Professional Practices	CCF203 Professional Practices
NIL	NIL	NIL	NIL	EEE308 Electrical Material and Wiring	EEF305 Electrical Materials, Wiring and Illumination
NIL	NIL	NIL	NIL	EEE504 Illumination Engineering	EEF512 Illumination Engineering
NIL	NIL	NIL	NIL	EEE506 Industrial Drives	EEF505 Electrical Drives
-	-	-	-	EEE507 Programmable Logic Controller	EEF506 Programmable Logic Controller
-	-	-	-	EEE503 Electrical Machines Control & Automation	EEF507Elements of Industrial Automation

**Equivalence to the courses (and hence exemptions) of other programmes to be granted to branch change candidates entering the Diploma in Electrical Engineering programme will be decided by the Programme Dean in consultation with the teaching staff of the Electrical Engineering Department.**



## **8. PROFORMAS FOR EVALUATION OF TERM WORK, ORALS AND PRACTICALS**

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

**Name and Signature of Internal Examiner      Name and Signature of External 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 - \_\_\_\_\_

[illegible]

**Name and Signature of Internal Examiner**

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

**Name and Signature of  
External Examiner**





**SECTION – II**

**SYLLABI OF COURSES**  
**(LEVEL-WISE)**



## **Level I**

### **Foundation Courses**

**Course ID :**

**Course Name** : Engineering physics (EE/IE/IF/ET)  
**Course Code** : CCF102  
**Course Abbreviation** : FPHB  
**Pre-requisite Course(s)** : Nil

**Teaching and evaluation scheme :****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.

**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 :**

**CCF102-1** Select proper material in engineering industry by analysis of its physical properties

**CCF102-2** Use basic principles of wave motion for related engineering applications

**CCF102-3** Use nanotechnology for quality improvement of materials

**CCF102-4** Apply principles of optics, electricity to solve engineering problems

**CCF102-5** Use LASERs, X-rays and photocell based equipments

**CCF102-6** Apply principles of fiber optics 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 Electrical equipment	PSO2 Electrical power system
<b>Competency:</b> Apply principles of Physics to solve engineering problems.	3	1	2	1	2	1	-	2	1	2	1	1
<b>CCF102-1</b> Select proper material in engineering industry by analysis of its physical properties	3	1	2	1	1	1	-	1	1	2	1	1
<b>CCF102-2</b> Use basic principles of wave motion for related engineering applications	3	1	2	-	1	1	-	2	1	2	1	1
<b>CCF102-3</b> Use nanotechnology for quality improvement of materials	3	1	1	-	2	1	-	-	1	2	1	1
<b>CCF102-4</b> Apply principles of optics, electricity to solve engineering problems	3	1	3	1	2	1	-	2	1	2	1	1
<b>CCF102-5</b> Use LASERS, X-rays and photocell based equipments	3	1	2	1	2	1	-	1	1	2	1	1
<b>CCF102-6</b> Apply principles of fiber optics for related engineering applications	3	1	2	1	2	1	-	1	1	2	1	1

### Content :

#### A) Theory :

#### Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<b>Course Outcome CCF102-1</b> Select proper material in engineering industry by analysis of its physical properties.			
<b>1</b>	<b>ELASTICITY</b> 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	<b>06</b>	<b>08</b>

	1.5 Factor of safety 1.6 Applications of elasticity 1.7 <b>Numerical problems</b>		
<b>Course Outcome CCF102-2</b> Use basic principles of wave motion for related engineering applications			
<b>2</b>	<b>PROPERTIES OF LIQUID</b> <b>2.1 INTRODUCTION</b> Definitions of density, specific volume, specific weight, specific gravity, compressibility of liquid <b>2.2 VISCOSITY</b> 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. <b>2.3 SURFACE TENSION</b> 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 <b>No numericals on above topic</b>	<b>16</b>  (02)    (06)    (08)	<b>18</b>  (02)    (06)    (10)
<b>3</b>	<b>WAVE MOTION</b> 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 <b>No numericals on above topic</b>	<b>06</b>	<b>08</b>
<b>Course Outcome CCF102-3</b> Use nanotechnology for quality improvement of materials.			
<b>4</b>	<b>INTRODUCTION TO NANOTECHNOLOGY</b> 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 <b>No numericals on above topic</b>	<b>04</b>	<b>06</b>

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

### Section II

Sr. No.	Topics / Subtopics	Lectures (Hours)	Theory Evaluation (Marks)
<b>Course Outcome CCF102-4 Apply principles of optics, electricity to solve engineering problems</b>			
<b>5</b>	<b>PROPERTIES OF LIGHT</b> 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 <b>Numerical problems</b>	<b>06</b>	<b>06</b>
<b>6</b>	<b>ELECTRICITY</b> 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 <b>Numerical problems</b>	<b>06</b>	<b>08</b>
<b>Course Outcome CCF102-5 Use LASERs, X-rays and photocell based equipments</b>			
<b>7</b>	<b>MODERN PHYSICS</b> <b>7.1 PHOTO ELECTRIC EFFECT</b> 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 <b>Numerical Problems</b> <b>7.2 LASER</b> 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 <b>No numericals on above topic</b> <b>7.3 X-RAYS</b> 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 <b>No numericals on above topic</b>	<b>14</b>  (06)  (04)  (04)	<b>18</b>  (08)  (06)  (04)
<b>Course Outcome CCF102-6 Apply principles of fiber optics for related engineering applications</b>			
<b>8</b>	<b>FIBER OPTICS</b> 8.1 Optical communication link 8.2 Principle of optical fiber (TIR) 8.3 Structure of optical fiber 8.4 Propagation of light in optical fiber	<b>06</b>	<b>08</b>

	8.5 Advantages of optical fibers over conventional metal conductors 8.6 Applications of optical fibers <b>No numericals on above topic</b>		
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

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

Section / Topic no.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total marks
		Remember	Understand	Application		
I/1	Elasticity	2	4	2	CCF102-1	08
I/2	Properties of liquids	10	6	2	CCF102-1	18
I/3	Wave motion	4	2	2	CCF102-2	08
I/4	Nanotechnology	2	4	-	CCF102-3	06
II/5	Properties of light	2	2	2	CCF102-4	06
II/6	Electricity	2	2	4	CCF102-4	08
II/7	Modern Physics	8	8	2	CCF102-5	18
II/8	Fiber Optics	2	4	2	CCF102-6	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.

**B) 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	i) Information search ii) Information presentation	CCF102-1 To CCF102-6
<b>( Any 10 of the following experiments )</b>			
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.	CCF102-1
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.	CCF102-1

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.	CCF102-1
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.	CCF102-1
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.	CCF102-4
7	To verify Snell's law using glass slab	i) Drawing necessary ray diagram ii) Measuring angles of incidence and refraction iii) Tabulating observations.	CCF102-4
8	To determine refractive index of prism by pin method	i) Removing parallax between the images and pins by observing the refracted ray through prism. ii) Measuring the angle of refraction correctly iii) Drawing the path of refracted ray through prism iv) Drawing inference regarding relation between angle of incidence & angle of refraction from $\delta$ graph v) Tabulating observations.	CCF102-4
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 $nL = \text{constant}$ iv) Tabulating observations.	CCF102-2
10	To study characteristics of photocell	i) Drawing circuit diagram ii) Handling different delicate instruments. iii) Tabulating observations iv) Drawing graph	CCF102-5

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.	CCF102-2
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 lengths on Meter bridge. iv) Tabulating observations.	CCF102-4

### 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

#### 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
<b>TOTAL</b>		<b>25</b>

##### ii) Progressive Skill Test :

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

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

Sr. No.	Criteria	Marks allotted
1	Neat & complete circuit Diagram / schematic Diagram.	05
2	Observations & Result Table	05
3	Sample Calculations with relevant Formulae.	05



4	Proper Graphs & Procedure / workmanship Safety measures	05
5	Oral Based on Term Work	05
	Total	25

**a) 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** <http://www.physicsclassroom.com>

i) <http://scienceworld.wolfram.com/physics/>

ii) <http://physics.about.com/>

**COURSE ID :****Course Name : CHEMISTRY OF ENGINEERING MATERIALS****Course Code : CCF104****Course Abbreviation : FCHB****Pre-requisites : 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	Practical Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	50 marks for continuous assessment ii. One PST of 25 marks	Term End Theory Exam (03 hours)	-	As per Proforma	
Marks	20		80	-	50 I	150

**Rationale:**

This course provides knowledge of chemical properties of materials and selection of appropriate material for specific applications in the field of engineering. Study of different polymers, insulators or dielectrics, adhesives and their applications in electrical appliances, electronic industries etc., study of corrosion and methods of prevention will make students realize importance of care and maintenance of machines and equipments. The contents of this subject are designed to enhance student's reasoning capacity and capabilities in solving challenging problems in engineering field

**Competency:** The aim of this course is to inculcate the following skills in the electrical technician;  
Apply principles of advanced chemistry to solve engineering problems.

**Cognitive :** Understanding concepts of chemistry for applications in the area of engineering.

**Psychomotor:** Sketching and labeling the diagrams for extraction of copper

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

Preparing chart of showing percentage, composition, properties and industrial applications of solders.

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

**COURSE OUTCOMES:**

**CCF104-1** Apply the basic principles of chemistry in Engineering field.

**CCF104-2** Use electrochemistry for electroplating and electro-refining as industrial applications.

**CCF104-3** Interpret the reasons of corrosion suggesting remedies using appropriate techniques.

**CCF104-4** Use relevant water treatment process to solve industry problems.

**CCF104-5** Select proper type of cell based on the requirement in electrical/ electronic and computer engineering.

**CCF104-6** Monitor extraction of copper, work with solders and semiconductors.

**CCF104-7** Select insulators, polymer, adhesives, composite materials for different applications in electrical engineering.

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

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” : 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 electrical equipment	PSO 2 electrical power system
Competency: Apply principles of advanced chemistry to solve engineering problems	3	3	3	3	2	1	-	2	2	2	2	2
CCF104-1 Apply the basic principles of chemistry in Engineering field.	3	3	2	-	2	-	-	2	2	2	2	2
CCF104-2 Use electrochemistry for electroplating and electro-refining as industrial applications	3	3	2	3	2	1	-	2	1	2	2	1
CCF104-3 Interpret the reasons of corrosion suggesting remedies using appropriate techniques	3	3	3	3	3	-	-	2	1	3	2	2
CCF104-4 Use relevant water treatment process to solve industry problems	3	3	3	1	3	2	-	2	1	1	1	1
CCF104-5 Select proper type of cell based on the requirement in electrical/ electronic and computer engineering	3	3	2	3	3	-	-	1	1	2	2	2
CCF104-6 Monitor extraction of copper, work with solders and semiconductors	3	3	3	2	3	-	-	3	2	3	3	3
CCF104-7 Select insulators, polymer, adhesives, composite materials for different applications in electrical engineering.	3	2	1	2	3	-	-	2	1	3	3	2

**CONTENTS:****A) THEORY****Section I**

<b>Sr. no.</b>	<b>Topics Subtopics</b>	<b>Teaching (Hours)</b>	<b>Theory evaluation Marks</b>
<b>CCF104-1</b> Apply the basic principles of chemistry in Engineering field.			
<b>1</b>	<b>ATOMIC STRUCTURE</b> 1.1 Atom :Fundamental particles, Nature of atom 1.2 Atomic Number, Mass Number, Isotopes and isobars 1.3 Bohr's theory of atom 1.4 Statement of Hund's rule of maximum multiplicity, Pauli's exclusion principle, Aufbau's principle 1.5 Rules of distribution of planetary electrons 1.6 Electronic configuration of atoms with atomic number 1-30 1.7 Lewis and Langmuir's concept of stable electronic configuration 1.8 Electrovalency and Co-valency 1.9 Formation Of electrovalent compounds- NaCl, MgO 1.10 Formation of Covalent compounds-H <sub>2</sub> O,CO <sub>2</sub>	<b>07</b>	<b>08</b>
<b>CCF104-2</b> Use electrochemistry for electroplating and electro-refining as industrial applications.			
<b>2</b>	<b>ELECTROCHEMISTRY</b> 2.1 Definitions- Conductor, Electrolyte, Electrode 2.2 Difference 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 CuSO <sub>4</sub> 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 Faradays Laws of Electrolysis 2.9 Numerical problems based on Faraday's laws	<b>07</b>	<b>08</b>
<b>CCF104-3</b> Interpret the reasons of corrosion suggesting remedies using appropriate techniques			
<b>3</b>	<b>CORROSION AND PROTECTIVE COATING</b> 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,	<b>07</b>	<b>08</b>

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	Metal cladding, Cementation or sherardizing		
<b>CCF104-4</b> Use relevant water treatment process to solve industry problems			
4	<b>WATER</b> 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 Dyeing Industry 4.6 scale formation in boilers , it's causes, disadvantages & removal of scale 4.7 Sterilization of water - Chlorination –by Cl <sub>2</sub> , 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

**Section –II**

Sr. no.	Topics/Subtopics	Teaching (Hours)	Theory evaluation Marks
<b>CCF104-5</b> Select proper type of cell based on the requirement in electrical/ electronic and computer engineering.			
5	<b>CELL AND BATTERIES</b> 5.1 Definition of Electrochemical cell, Battery, Charge, Discharge, Closed Circuit Voltage, Electrochemical couple, Internal resistance, Open Circuit Voltage, Separator, E.M.F. 5.2 Classification of Batteries such as – Primary, Secondary and Reserve Batteries 5.3 Construction, Working and Applications of a Dry Cell, Lead Acid Storage Cell 5.4 Hydrogen-Oxygen fuel cell, reactions, uses & advantages 5.5 Introduction of solar cell	08	08
<b>CCF104-6</b> Monitor extraction of copper, work with solders and semiconductors			
6	<b>METALLIC CONDUCTORS</b> 6.1 Occurrence of metals 6.2 Mineral , ore, flux, Gangue & Slag 6.3 Flow chart of Metallurgical processes 6.4 Concentration of ores—Physical Methods, Gravity Separation Method, Electromagnetic, Separation, Froth floatation method 6.5 Chemical Methods - Calcination & Roasting . 6.6 Important ores of copper Metallurgy of copper-Extraction of copper from copper pyrites by concentration , roasting, smelting , Bessemerisation , Electrorefining 6.7 Physical chemical properties (action of air ,water & acids)	12	14

	6.8. Uses of Copper		
<b>7</b>	<b>SOLDERS</b> 7.1 Definition of alloy , classification of alloys & purposes of making alloy 7.2 Composition, properties & applications of 7.2.1 Soft solder. 7.2.2 Tinmann's solder, 7.2.3 Brazing alloy , 7.2.4 Plumber's solder 7.2.5 Rose metal 7.2.6 Woods Metal	<b>03</b>	<b>06</b>
<b>8</b>	<b>SEMICONDUCTORS</b> 8.1 Definition of semiconductor 8.2 Properties & Applications of Semiconductors such as 8.2.1 Silicon 8.2.2 Germanium 8.2.3 Graphite <b>8.2.4 Silicon carbide</b>	<b>02</b>	<b>04</b>
<b>CCF104-7</b> Select insulators, polymer, adhesives, composite materials for different applications in electrical engineering			
<b>9</b>	<b>CHEMISTRY OF NONMETALLIC ENGINEERING MATERIALS</b> <b>9.1 INSULATORS</b> 9.1.1 Definition & Characteristics of good insulator 9.1.2 Preparation, properties & uses of glass wool, Thermocole 9.1.3 Properties & uses of Asbestos , Ceramics , mica <b>9.2 POLYMERS</b> 9.2.1 Definition of Polymer , Polymerization , types of polymerisation 9.2.2 Properties & uses of Teflon & Bakelite <b>9.3 ADHESIVES</b> 9.3.1 Definition of Adhesives 9.3.2 Characteristics of good Adhesives 9.3.3 Properties & uses of Adhesives. <b>9.4 COMPOSITE MATERIALS</b> 9.4.1 Definition, Classification, Properties & Application of composite materials.	<b>07</b>	<b>08</b>

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

Section / Topic no.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total marks
		Remember	Understand	Application		
I / 1	Atomic structure	06	02	-	CCF104-1	08
I / 2	Electrochemistry	02	02	04	CCF104-2	08
I / 3	Corrosion	04	02	02	CCF104-3	08

	&protective coating					
I / 4	Water	08	04	04	CCF104-4	16
II/5	Cell & Batteries	04	02	02	CCF104-5	08
II/6	Metallic conductors	08	03	03	CCF104-6	14
II/7	Solders	02	02	02	CCF104-6	06
II/8	Semiconductors	02	02	-	CCF104-6	04
II/9	Chemistry of nonmetallic engg. materials	02	02	04	CCF104-7	08
	Total					80

A. **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	CO
1	Introduction to Chemistry laboratory	Awareness of chemicals ,glasswares &instruments used in chemistry laboratory	CCF104-1
2	Preparation of 1 N, 0.5 N & 0.1 N NaOH, HCl, Oxalic acid, FeSO <sub>4</sub> , etc.	Skill of weighing , handling Glassware & measuring solutions	CCF104-1
3	Titration of strong acid and strong base. (HCl X NaOH)	Skills of determining accurate end point of titration & development of measurement skills.	CCF104-1
4	Titration of strong acid, strong base& weak acid (HCl X NaOH X H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O	Skills of determining accurate end point of titration & development of measurement skills.	CCF104-1
5	Titration of weak base , strong acid & strong base (Na <sub>2</sub> CO <sub>3</sub> X H <sub>2</sub> SO <sub>4</sub> X KOH	Skills of determining accurate end point of titration & development of measurement skills.	CCF104-1
6	Estimation of chloride content in water by Mohr' s method	Measurement skill utilization of practical data for testing & estimation	CCF104-4
7	Determination of Ca and Mg ions in given sample of water by E.D.T.A method	Measurement skill utilization of practical data for testing & estimation	CCF104-4
8	Determination of viscosity of oil by Ostwald's viscometer	Measurement skill utilization of practical data for testing & estimation	CCF104-1
9	Estimation of Ca in limestone.	Measurement skill utilization of practical data for testing & estimation	CCF104-6
10	Estimation of % of Fe in given sample of steel	Measurement skill utilization of practical data for testing & estimation	CCF104-6
11	Reports of expert lecturers demo	Application of chemistry in engineering field	CCF104-6
12	Report of market survey	Collection of data	CCF104-4

ii) **Progressive Skills Test :**

**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

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

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

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

**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 <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	
7.	P. C. Jain	Chemistry of Engineering Materials	
8	S. S. Dara	A text of Engineering Chemistry	

**b) Websites.**

[www.substech.com](http://www.substech.com)

[www.kentchemistry.com](http://www.kentchemistry.com)



**Course ID :**

**Course Name** : Basic Mathematics  
**Course Code** : CCF105  
**Course Abbreviation** : FBMT  
**Pre-requisite Course(s)** : Nil

**Teaching and evaluation scheme:****Teaching Schem :**

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 learning	PSO1 Electrical equipment	PSO2 Electrical power systems
<b>Competency:</b> Apply principles of Basic Mathematics to solve mathematical problems	3	2	3	2	-	-	1	2	1	3	2	2
<b>CCF105-1 :</b> To solve simultaneous equations using Cramer's rule.	3	2	2	-	-	-	1	1	1	3	2	2
<b>CCF105-2 :</b> To resolve a given function into partial fractions.	3	2	3	-	-	-	1	1	1	3	1	1
<b>CCF105-3 :</b> To solve simultaneous equations by using inverse of matrix method.	3	2	3	1	2	-	1	2	3	3	2	2
<b>CCF105-4 :</b> To expand any binomial expression for positive integral index.	3	2	3	1	2	-	1	2	3	3	1	1
<b>CCF105-5 :</b> To memorize and solve problems using trigonometric formulae.	3	2	3	1	2	-	1	2	3	3	3	3

**Content :****A) Theory :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<b>Course Outcome CCF105-1 : To solve simultaneous equations using Cramer's rule</b>			
<b>1</b>	<b>Determinants</b> 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 Cramer's Rule 1.4 Consistency of equations using Determinants	<b>04</b>	<b>06</b>
<b>Course Outcome CCF105-2 : To resolve a given function into partial fractions</b>			
<b>2</b>	<b>Partial Fractions</b> 2.1 Definition of rational, proper and improper fractions 2.2 Various cases of Partial fractions and Examples	<b>06</b>	<b>12</b>
<b>Course Outcome CCF105-3 : To solve simultaneous equations by using inverse of matrix method</b>			

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<b>3</b>	<b>Matrices</b> 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	<b>10</b>	<b>16</b>
<i>Course Outcome CCF105-4 : To expand any binomial expression for positive integral index.</i>			
<b>4</b>	<b>Binomial Theorem</b> 4.1 Statement of theorem for positive integral power 4.2 Expansion 4.3 Simple Examples on expansion	<b>04</b>	<b>06</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

## Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>Course Outcome CCF105-5 : To memorize and solve problems using trigonometric formulae.</i>			
<b>5</b>	<b>Trigonometric Ratios and Identities</b> 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	<b>02</b>	<b>04</b>
<b>6</b>	<b>Trigonometric ratios of Compound and Allied Angles</b> 6.1 Proofs of sine ,cosine and tan of (A+B) and (A-B) 6.2 Examples	<b>06</b>	<b>08</b>
<b>7</b>	<b>Trigonometric ratios of Multiple Angles</b> 7.1 Proofs of sine, cosine and tangent of 2 $\theta$ , 3 $\theta$ 7.2 Examples	<b>05</b>	<b>10</b>
<b>8</b>	<b>Factorization and Defactorization Formulae</b> 8.1 Proofs of above formulae 8.2 Examples	<b>04</b>	<b>08</b>
<b>9</b>	<b>Inverse Trigonometric Ratios</b> 9.1 Definition 9.2 Principle value 9.3 Proof of standard formulae 9.4 Examples	<b>07</b>	<b>10</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

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

Topic No.	Name of topic	Distribution of marks (level wise)			Total Marks	CO
		Remember	Understand	Apply		
1	Determinants	-	2	4	06	EEF105-1
2	Partial Fractions	2	2	8	12	EEF105-2
3	Matrices	2	2	12	16	EEF105-3
4	Binomial Theorem	2	-	4	06	EEF105-4
5	Trigonometric Ratios and Identities	2	-	2	04	EEF105-5
6	Allied Angles	2	2	4	08	EEF105-5
7	Compound Angles	2	-	8	10	EEF105-5
8	Factorisation & De-factorisation angles	2	-	6	08	EEF105-5
9	Inverse Trigonometric ratios	2	2	6	10	EEF105-5
<b>TOTAL</b>		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	Factorisation & De-factorisation angles	Examples on Allied angles
10	Inverse Trigonometric Ratios	Examples on principle value and trigonometric functions

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

1. Lectures cum Demonstrations
2. Tutorials

**Teaching and Learning resources:**

1. Chalk board

## 2. Item Bank

**REFERENCE MATERIAL :****a) Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1.	G.V. Kumbhojkar	A Text Book on Engineering Mathematics(First Year Diploma)	Phadke 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](http://www.khanacademy.org)
  - ii) [www.easycalculation.com](http://www.easycalculation.com)
  - iii) [www.math-magic.com](http://www.math-magic.com)
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**COURSE ID :**

**Course Name : 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-

**Cognitive:** Understanding and applying principles of Engineering Mathematics to Engineering problems

**Psychomotor:** Use of co-ordinate geometry in animation, autocad, computer graphics etc. AND proper use of calculator.

**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 learning	PSO1 Electrical equipment	PSO2 Electrical power system
Competency: Apply principles of Engineering Mathematics to solve Engineering problems	3	2	3	2	-	-	1	2	1	3	3	3
CCF106-1 : To solve problems on two dimensional co-ordinate geometry for straight line and circles.	3	2	2	-	-	-	1	1	1	3	2	2
CCF106-2 : To find approximate solution of algebraic equations and simultaneous equations by various methods.	3	2	3	-	-	-	1	1	1	3	2	2
CCF106-3 : To find limits of different types of functions using various methods.	3	2	3	1	2	-	1	2	3	3	3	3
CCF106-4 : To solve the problems of maxima, minima and geometrical applications.	3	2	3	1	2	-	1	2	3	3	3	3

### CONTENT:

#### B. THEORY :

#### Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	<i>Course outcome CCF106-1 : To solve problems on two dimensional co-ordinate geometry for straight line and circles.</i>		
1	<b>Point and Distances</b> 1.1 Distance formula (Only mention, No examples ) 1.2 Section formula & midpoint formula (No Examples)	02	04

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	<b>Course outcome CCF106-1 : To solve problems on two dimensional co-ordinate geometry for straight line and circles.</b>		
	& without proof ) 1.3 Centroid of a triangle & Area of Triangle 1.4 Collinearity		
<b>2</b>	<b>The Straight line</b> 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	<b>06</b>	<b>08</b>
<b>3</b>	<b>Circle</b> 3.1 Equations of Circle ( various forms ) 3.2 Examples to find equation of circles	<b>04</b>	<b>08</b>
	<b>Course outcome CCF106-2: To find approximate solution of algebraic equations and simultaneous equations by various methods.</b>		
<b>4</b>	<b>Numerical solution of Algebraic Equations</b> 4.1 Bisection Method 4.2 Regula- Falsi Method	<b>06</b>	<b>10</b>
<b>5</b>	<b>Numerical solution to simultaneous equations</b> 5.1 Jacobi's Method 5.2 Gauss-Seidel method	<b>06</b>	<b>10</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

## Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	<b>Course outcome CCF106-3 : To find limits of different types of functions using various methods.</b>		
<b>6</b>	<b>Functions</b> 6.1 Definition and Concept of function 6.2 Definition of Odd & Even functions, Explicit & implicit functions, Composite functions, Parametric functions 6.3 Value of a function 6.4 Examples on value of functions, Odd & Even	<b>03</b>	<b>06</b>



Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	<b>Course outcome CCF106-3 : To find limits of different types of functions using various methods.</b>		
	functions , Composite functions		
<b>7</b>	<b>Limits</b> 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 .	<b>06</b>	<b>08</b>
	<b>Course outcome CCF106-4 : To solve the problems of maxima, minima and geometrical applications.</b>		
<b>8</b>	<b>Differentiation</b> 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	<b>12</b>	<b>20</b>
<b>9</b>	<b>Applications Of Derivatives</b> 9.1 Geometrical meaning of derivative (To find equation of Tangent and normal ) 9.2 Maxima and minima of functions	<b>03</b>	<b>06</b>
	<b>Total</b>	<b>24</b>	<b>40</b>
1.Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only. 2. 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	CO
		Remember	Understand	Apply		
1	Point and Distances	2	--	2	4	CCF106-1
2	Straight line	2	2	4	8	CCF106-1
3	Circle	2	2	4	8	CCF106-1

4	Numerical solution of Algebraic Equations and simultaneous Equations	2	2	16	20	CCF106-2
5						CCF106-2
6	Functions	2	-	4	6	CCF106-3
7	Limits	2	2	4	8	CCF106-3
8	Differentiation	4	4	12	20	CCF106-4
9						
10	Applications Of Derivatives	--	--	6	6	CCF106-4
Total		16	12	52	80	CCF106-4

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

**C. 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 Centroid of triangle, area of triangle, collinearity
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:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
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](http://www.khanacademy.org) ii) [www.easycalculation.com](http://www.easycalculation.com)  
iii) [www.math-magic.com](http://www.math-magic.com)

**Course ID:****Course Name : Engineering Graphics****Course Code : CCF109****Course Abbreviation : FEGR****Pre-requisite Course(s) : NIL****Teaching and evaluation scheme :****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	Practical Examination	
Details of evaluation	-	1)25 marks for each sheet . 2)One PST of 25 marks.	-	As Per Performa-V	As Per Performa-IV	
Marks	-	--	-	25	50 E	75

**Rationale :**

Engineering Graphics is one of the ways of communication among engineering professionals. It describes scientific facts, concepts, principles and techniques of drawing in any engineering fields to express the ideas and conveying the instructions which are use for carrying out tasks at work place. 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. So it is necessary to all programmes.

**Competency:**

Interpret and use the drawings of various machines/components.

**Cognitive:** Understand the different types of manual and computer generated engineering drawing.

**Psychomotor:** Draw the required drawings of machines/components using the relevant tools/methods

**Affective:** Attitudes of i) neatness, ii) aesthetic look, iii) Accuracy and iv) planning.

CCF109-1: Use the basic tools of manual and computer aided drawing.

CCF109-2: Draw and interpret the projections of points and lines.

CCF109-3: Draw and interpret the projections of planes contained in objects and machine components

CCF109-4: Draw and interpret the orthographic projections of objects and machine components

CCF109-5: Draw and interpret the sectional views of objects and machine components

CCF109-6: Draw and interpret the isometric views of objects and machine components

**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 Electrical equipment	PSO2 Electrical power system
Competency: use the drawings of various machines/components	3	2	3	2	-	-	-	2	1	3	3	3
CCF109-1: Use the basic tools of manual and computer aided drawing.	3	2	2	-	-	-	-	1	1	3	2	2
CCF109-2: Draw and interpret the projections of points and lines.	3	2	3	-	-	-	-	1	1	3	2	2
CCF109-3: Draw and interpret the projections of planes contained in objects and machine components	3	2	3	1	2	-	-	2	3	3	3	3
CCF109-4: Draw and interpret the orthographic projections of objects and machine components	3	2	3	1	2	-	-	2	3	3	3	3
CCF109-5: Draw and interpret the sectional views of objects and machine component	3	2	3	1	1	-	-	2	2	2	2	2
CCF109-6: Draw and interpret the isometric views of objects and machine component	3	2	3	1	1	-	-	2	2	2	2	2

**SECTION -I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Practical Evaluation (Marks)
<i>CO: CCF109-1: Use the basic tools of manual and computer aided drawing.</i>			
<b>1</b>	<b>Introduction To Engineering Drawing</b> 1.1 Drawing Instruments and their uses 1.2 Standard sizes of drawing sheets 1.3 Letters and numbers (single stroke vertical) 1.4 Convention of lines and their applications 1.5 Scale (reduced, enlarged & full size) Plain scale and Diagonal scale. 1.6 Dimensioning technique as per SP-46 (Latest Edition)	<b>06</b>	<b>10</b>

<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>	<b>Practical Evaluation (Marks)</b>
	Types and applications of chain, parallel and Co-ordinate dimensioning 1.7 Introduction to CAD software (Basic commands like Draw, modify). 1.8 Advantages of CAD, 1.9. Geometrical constructions		
<i>CO: CCF109-2: Draw and interpret the projections of points and lines.</i>			
<b>2</b>	<b>Projection Of Point And Lines</b> 2.1 Projection of points when point is in first quadrant Only 2.2 Projection of Line inclined to one Reference plane and Parallel to other Reference Plane (Both ends of line should be in first quadrant )	<b>04</b>	<b>06</b>
<i>CO: CCF109-3: Draw and interpret the projections of planes contained in objects and machine components.</i>			
<b>3</b>	<b>Projection Of Planes</b> 3.1 Projection of Planes of Circular , Square,  Triangular, Rectangular , Pentagonal , Hexagonal Shapes Inclined To One Reference Plane And perpendicular to other Reference Plane. ( Planes in First Quadrant Only)	<b>06</b>	<b>06</b>
<b>SECTION-II</b>			
<i>CO: CCF109-4: Draw and interpret the orthographic projections of objects and machine components.</i>			
<b>4</b>	<b>Orthographic Projection</b> 4.1 Introduction of Orthographic Projection-First and Third angle Projection Method 4.2 Conversion of Pictorial view into Orthographic Views. (First angle Projection Method Only) 4.3 Dimensioning Technique as per SP-46	<b>06</b>	<b>10</b>
<i>CO: CCF109-5: Draw and interpret the sectional views of objects and machine components</i>			
<b>5</b>	<b>Sectional Views.</b> 5.1 Types of sections 5.2 Conversion of pictorial view into sectional Orthographic views. (First Angle Projection Method only)	<b>04</b>	<b>06</b>
<i>CO: CCF109-6: Draw and interpret the isometric views of objects and machine components.</i>			

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Practical Evaluation (Marks)
6	<b>Isometric Projection</b> 6.1 Introduction 6.2 Isometric Axis 6.3 Isometric scale 6.4 Drawing of Isometric view and Projection. 6.5 Conversion of Orthographic Views into Isometric view/projection(Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces)	06	12
	<b>Total</b>	<b>32</b>	<b>50</b>
Semester end Practical exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**a) Specification table for setting question paper for semester end Practical examination :**

Topic No.	Name of topic	Distribution of marks			Total marks	CO
		Remember	Understand	Apply		
1	Introduction To Engineering Drawing	04	02	04	10	CCF109-1
2	Projection of Point And Lines	02	02	02	06	CCF109-2
3	Projection of Planes	02	02	02	06	CCF109-3
4	Orthographic projection	02	02	04	08	CCF109-4
5	Sectional Views.	02	02	04	08	CCF109-5
6	Isometric Projection	04	02	06	12	CCF109-6
	<b>TOTAL</b>	16	12	22	50	

Semester end practical exam 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) Practical:**

**List of Practical:**

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	CO
1	Geometrical Constructions Using CAD (1 Sheet)	To develop drawing skill	CCF109-1
2	Projections of line (1 Sheet)	To develop drawing ability in Projections of line	CCF109-2
3	Projections of Planes (1 Sheet)	To develop drawing ability in Projections of Planes	CCF109-3
4	Orthographic projection (1 Sheet)	To develop drawing ability to draw Orthographic projection	CCF109-4

5	Sectional Views. (1 Sheet)	To develop drawing ability in sectional views	CCF109-5
6	Isometric Projection (2 Sheet) Isometric views of two objects – 1 sheet Isometric Projections of two objects – 1 sheet	To develop ability to draw Isometric projection	CCF109-6

**Assessment criteria for term work****c) 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

One mid-term **Progressive Skill Test** of **50** marks shall be conducted as per criteria given below:

Sr No.	Criteria	Marks allotted
1	Correctness and understanding	20
2	Line work and neatness	10
3	Dimensioning and judgment without measurement	10
4	Proper use of instrument	10
	Total	50

**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

**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](http://en.wikipedia.org/wiki/Engineering_drawing)
  - 4) <http://www.engineeringdrawing.org/>
  - 5) [http://www.teachengineering.org/view\\_activity](http://www.teachengineering.org/view_activity)
  - 6) [www.howtoread.co.in/2013/06/how-to-read-ed.html](http://www.howtoread.co.in/2013/06/how-to-read-ed.html)
  - 7) <http://www.slideshare.net/akhilrocker143/edp>
  - 8) <http://www.24framesdigital.com/pstulpule>
-

**Course ID:**

**Course Name** : Applied Mechanics  
**Course Code** : CCF110  
**Course Abbreviation** : FAPM  
**Pre-requisite Course(s)** : Nil

**Teaching and evaluation scheme :****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	
<b>Details of Evaluation</b>	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	
<b>Marks</b>	<b>20</b>	<b>--</b>	<b>80</b>	<b>25</b>	<b>125</b>

**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 Electrical equipment	PSO2 Electrical power system
<b>Competency:</b> Apply principles of applied mechanics to solve engineering problems.	3	3	3	2	2	-	-	1	1	1	3	3
<b>CCF110-1</b> Determine resultant of coplanar force systems	3	3	-	-	2	-	-	1	1	2	2	2
<b>CCF110-2</b> Solve problems on bodies in equilibrium with and without friction	3	3	3	3	2	-	-	1	1	2	2	2
<b>CCF110-3</b> Solve problems on statics graphically	2	3	3	1	1	-	-	1	1	1	3	3
<b>CCF110-4</b> Solve problems on centre of gravity of laminas and solids	3	3	2	2	3	-	-	1	1	2	2	3
<b>CCF110-5</b> Solve problems on motion using kinematic and kinetic equations	3	3	2	1	3	-	-	1	1	2	2	2
<b>CCF110-6</b> 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)
<b>Course Outcome CCF110-1 Determine resultant of coplanar force systems</b>			
<b>1</b>	<b>Resolution and Composition of Forces</b> 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	<b>10</b>	<b>12</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	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		
<b>Course Outcome CCF110-2</b> Solve problems on bodies in equilibrium with and without friction			
<b>2.</b>	<b>Equilibrium of Bodies</b> 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)	<b>10</b>	<b>10</b>
<b>Course Outcome CCF110-3</b> Solve problems on statics graphically			
<b>3</b>	<b>Graphic Statics</b> 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	<b>06</b>	<b>08</b>
<b>4</b>	<b>Friction</b> 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.	<b>06</b>	<b>10</b>
	<b>Total</b>	<b>32</b>	<b>40</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

## Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<b>Course Outcome CCF110-4 Solve problems on centre of gravity of laminas and solids</b>			
<b>5</b>	<b>Centroid and Centre of Gravity</b> 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	<b>08</b>	<b>08</b>
<b>Course Outcome CCF110-5 Solve problems on motion using kinematic and kinetic equations</b>			
<b>6</b>	<b>Rectilinear Motion</b> 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 6.3 Definition of momentum. Law of conservation of momentum. Simple problems	<b>08</b>	<b>08</b>
<b>7</b>	<b>Angular Motion</b> 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	<b>04</b>	<b>06</b>
<b>8</b>	<b>Work, Power, Energy</b> 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	<b>04</b>	<b>08</b>
<b>Course Outcome CCF110-6 Solve problems on simple lifting machines</b>			
<b>9</b>	<b>Simple Lifting Machines</b> 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	<b>08</b>	<b>10</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	questions on any particular machines are not expected; they shall be covered in practicals)		
	<b>Total</b>	<b>32</b>	<b>40</b>

**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	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.

**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 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	<b>Experiments on equilibrium of bodies :</b> (any six ) 1. Verification of law of polygon of forces 2. Verification of law of parallelogram of	1. Self learning ability using laboratory manual 2. Measuring dimensions and angles	CCF110-2

	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	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	CCF110-4
8-11	<b>Experiments on simple lifting machines: (any four)</b>  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	<b>Graphic Statics :</b> 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

**B) 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****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	2.5
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
	Decency and presentation	2.5
<b>TOTAL</b>		<b>25</b>

**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](http://en.wikipedia.org/wiki/Applied_mechanics)
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**COURSE ID:**

**Course Name : COMPUTER FUNDAMENTALS**  
**Course Code : EEF101**  
**Course Abbreviation : FCFA**

**TEACHING AND EVALUATION SCHEME:**

**Pre-requisite Course(s) : NIL**  
**Teaching Scheme: MPECS 2016**

Scheme component	Hours / week	Credits
Theory	2	4
Practical	2	

**Evaluation Scheme:**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (Internal)	
<b>Details of Evaluation</b>	Average of two tests of 20 marks each to be converted out of 10 marks	i. 25 marks for each practical. ii. One PST of 25 marks.	Term End Online Theory Exam (01 hour)	As per Proforma -II	----	
<b>Marks</b>	<b>10</b>	<b>--</b>	<b>40</b>	<b>25</b>	<b>----</b>	<b>75</b>

**RATIONALE:**

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

The primary purpose of this course is to give an elementary but sound fundamental understanding of how computers work, its basic hardware software components, what basic applications of computer technology currently exist, how they work and basic knowledge and applications of Internet.

**COMPETENCY**

Work on computers for day to day activities while carrying out simple trouble shooting as well.

**Cognitive:** i ) Identify the basic parts of a computer system and relationships among component. ii ) Describe characteristics and functions of CPU's, motherboard, RAM, expansion connection, hard drives and CD-ROM drives.

**Psychomotor:** i) Investigate computer system, Network & computer program ii) drawing flow chart for computer programs constructions

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

**COURSE OUTCOMES:**

**EEF101-1:** Identify different types of computers & its application

**EEF101-2:** Relate functions of hardware & software components of a computer system

**EEF101-3:** Compare basic differences of among operating systems

**EEF101-4:** Illustrate computer programs, tools & languages

**EEF101-5:** Demonstrate & Classify computer networks

**EEF101-6:** Use Internet by safe surfing

**EEF101-7:** Design files of word processors, spreadsheets, presentation software, and database application

#### 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	PSO1 Electrical equipment	PSO2 Electrical power systems
Competency: Work on computers for day to day activities while carrying out simple trouble shooting as well	2	2	2	2	2	1	1	1	1	1	3	3
EEF101-1: State types of computers & its application	1	-	2	2	2	2	-	2	2	2	2	2
EEF101-2: Relate functions of hardware & software components of a computer system	1	1	2	2	2	-	-	-	1	2	2	2
EEF101-3: Compare basic differences of among operating systems	1	-	3	1	1	-	-	1	1	1	3	1
EEF101-4: Illustrate computer programs, tools & languages	-	-	2	2	3	-	-	1	1	2	2	2
EEF101-5: Demonstrate & Classify computer networks	-	-	2	1	3	-	-	1	1	2	2	2
EEF101-6: Use Internet by safe surfing	-	-	1	1	2	-	-	1	1	1	2	2
EEF101-7: Design files of word processors, spreadsheets, presentation software, and database application	-	-	2	2	1	-	1	3	2	3	3	3

**CONTENT:**

<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>	<b>Theory Evaluation (Marks)</b>
<b>Course Outcome EEF101-1 : Identify different types of computers &amp; their application</b>			
<b>1</b>	<b>INTRODUCTION TO COMPUTERS</b>  1.1 History of computers 1.2 Types of computers 1.3 Applications of computers –Education, Business, Medical, Engineering etc.	<b>2</b>	<b>04</b>
<b>Course Outcome EEF101-2 : Relate functions of hardware &amp; software components of a computer system</b>			
<b>2</b>	<b>SYSTEM UNIT</b>  2.1 System Board 2.2 Microprocessor 2.3 Memory and its types 2.4 Expansion cards	<b>2</b>	<b>04</b>
<b>3</b>	<b>HARDWARE COMPONENTS</b>  3.1 Input devices and its connections: Keyboard, Mouse, Scanner, Microphone 3.2 Output devices and its connections: Monitors, Printers, Projectors, Speakers 3.3 Storage devices: Hard disks, Magnetic Tapes, Optical Discs, Pen drive 3.4 Tips on “How to buy a computer?”.	<b>4</b>	<b>04</b>
<b>Course Outcome EEF101-3 : Compare basic differences of among operating systems</b>			
<b>4</b>	<b>INTRODUCTION TO SOFTWARE</b>  4.1 Types of software 4.1.1 System software 4.1.2 Application Software 4.2 Introduction to Operating System 4.2.1 Definition: Operating System 4.2.2 Role of Operating System 4.2.3 Various Examples of Operating Systems	<b>4</b>	<b>04</b>
<b>Course Outcome EEF101-4 : Illustrate computer programs, tools &amp; languages</b>			
<b>5</b>	<b>COMPUTER PROGRAM</b>  5.1 Purpose of program planning 5.2 Algorithm 5.3 Flowchart 5.4 Pseudocode 5.5 Plan the logic of a computer program 5.6 Commonly used tools for program planning and their use	<b>4</b>	<b>04</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<b>6</b>	<b>COMPUTER LANGUAGES</b>  6.1 Computer languages or programming languages 6.2 Three broad categories of programming languages- machine, assembly, and high-level languages 6.3 programming language tools - assembler, compiler, linker, and interpreter 6.4 Concepts of object-oriented programming languages 6.5 concepts such as Subprogram, Characteristics of a good programming language	4	04
<b>Course Outcome EEF101-5: Demonstrate &amp; Classify computer networks</b>			
<b>7</b>	<b>COMPUTER NETWORKS</b>  7.1 Basic elements of a communication system 7.2 Data transmission modes 7.3 Data transmission speed & category 7.4 Data transmission media 7.5 Digital & Analog data transmission 7.6 Concept : Network 7.7 Types of Networks : LAN, MAN, WAN	4	04
<b>Course Outcome EEF101-6: Use Internet by safe surfing.</b>			
<b>8</b>	<b>INTERNET &amp; CYBER LAWS</b>  8.1 Internet basic terminology 8.2 Client, server concepts 8.3 Applications of Internet 8.4 Hardware & software requirements for internet connection 8.4 Various examples of Browsers 8.5 Browsing 8.6 Search Engines 8.7 Virus, Types of Viruses, Virus Protection 8.8 Introduction to Cyber Law 8.9 Information Technology Act of India 2000	4	06
<b>Course Outcome EEF101-7 : Design files of word processors, spreadsheets, presentation software, database application</b>			
<b>9</b>	<b>OFFICE AUTOMATION TOOLS</b>  9.1 MS-Word – Opening menus, toolbars, opening and closing documents, clipboard concept 9.2 MS – Excel – Working and manipulating data with excel, formulas, functions, chart and its types 9.3 MS – PowerPoint – Working with PowerPoint and presentation ,Changing layout, Graphs , Auto content wizard ,Slide show, Animation effects,Normal, outline, Slide sorter, Reading view.	4	06

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

Sr. No.	Title of Experiment	Skills to be developed	Course outcome
1.	Understanding PC(system unit and connections of internal components)	1. Identify the front and rear panel components of CPU 2. Identify different components inside the CPU cabinet 2.1 Identify different components on motherboard. 2.2 Motherboard connection. 2.3 Graphics card connection. 2.4 Network interface card connection.	EEF101-2
2.	Understanding the storage devices	1. Study various secondary storage devices along with their capacities. 2. Connecting HDD, and CD, DVD drives. 3. Attaching USB devices. 4. Care of the above devices.	EEF102-3
3.	Understanding the input/output devices and their connections	1. Study of connections of mouse, keyboard, monitor, printer. 2. Install driver software for a printer, Scanner 3. Set up a printer & scanner 4. Scan a page, print a test page	EEF101-3
4.	Study of system software with basics of OS	1. Understanding the concept of system and application software. 2. Examples of system software. 3. Study of application software. 4. Understand the concept & functions of Operating system, Examples of Operating system 5. Overview of Windows OS	EEF104
5.	Creating and Editing a word document	1. Use of menus and submenus. 2. Type and format the text matter in paragraphs. 3. Set up page size, margins 4. Insert headers and footers, bullets. 5. Use of borders and shading 6. Format picture, word-art, text box etc. 7. Typing text in multi-columns 8. Use of equation editor	EEF101-7
6.	Inserting table and Mail-Merge	Table: 1. Insert, format Table. 2. Sort data in table Mail-Merge: 1. Understand the mail-merge Facility. 2. Create main document and edit it 3. Create & edit data source 4. Merge the main document and data source. 5. Merge to file and merge to print.	EEF101-7
7.	Creating and Editing a work-book	1. Use of menus and submenus. 2. Enter the data in worksheet. 3. Creating a table in worksheet. 4. Use of editing commands. 5. Fill series by auto-fill handle, Insert / delete rows, columns and worksheet. 6. Set up page size, margins.& set the print area.	EEF107

8	Understanding the basics of presentation software & Creating a new presentation	1. Insert new / duplicate slides 2. Create objects on a slide and use general editing operations. 3. Use of different views in presentation 4. Use standard templates for slides. 5. Use preset animation, slide transition and Prepare speaker notes.	EEF101-7
9	Using advanced features of slide-show	1. Use of custom animation effect 2. Use of action buttons on slides 3. Rehearse time-setting of slide show	EEF101-7
10	Making use of Internet (Email, Chat, virus protection.)	1. Study of different types of networks. 2. Visit the website. 3. Using search engines. 4. Register online for e-mail ID. 5. Communicate with others using e-mail 6. Chatting 7. Installation, use and update of Anti-virus software 8. Removing detected viruses	EEF101-6
11	Mini Project	Mini Project based on Microsoft office suite which incorporates presentation, database & spreadsheet handling, word processing skills.	EEF101-7

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

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	10
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & computer handling skill	05
5	Use of toolbar, menu bar and short cut keys.	05
6	Logical thinking and approach	10
7	Oral Based on Lab work and completion of task	10
TOTAL		50

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

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

Sr. no	Criteria	Marks allotted
1.	Technical ability	20
2.	Communication skill	10
3.	Logical approach	20
TOTAL.		50

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

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

**Teaching and Learning resources:**

1. Chalk board
2. O.H.P.
3. Slides
4. Self-learning Tutors

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

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

**b) Websites**

- iii) <http://my.safaribooksonline.com>
- iv) <http://www.edulearn.com>
- v) <http://kvsecontents.in/computer-fundamentals>

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**Course ID :****Course Name : Fundamentals Of Electricity And Magnetism****Course Code : EEF102****Course Abbreviation : FFEM****Pre-requisite Course(s) : Nil****Teaching and evaluation scheme :****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	Practical Examination (Internal)	
<b>Details of Evaluation</b>	Average of two tests of 20 marks each	iii. 25 marks for each practical iv. One PST of 25 marks	Term End Theory Exam (03 hours)	-	As per Proforma II	
<b>Marks</b>	20	--	80	-	50I	150

**Rationale :**

The Diploma Course in Electrical Engineering mainly involves the study of Electrical machines, equipments and instruments. In order to understand the working principle, construction, operation and applications of the various Electrical machines, equipments and instruments; the basic concepts, rules and laws of Electric and Magnetic Circuits be understood by the students of Electrical Engineering Course.

This subject will help the students to study, understand and comprehend the fundamentals of various facts, the basic concepts, rules and laws of Electric and Magnetic Circuits. This subject is classified as Engineering Science subject.

**Competency:**

Apply the fundamental principles of electricity and magnetism to simple electrical engineering applications.

**Cognitive:** Understand electrical charges, magnetism and electromagnetism.

**Psychomotor:** Use the basic electrical components in electrical engineering applications.

**Affective :** Attitude of i) safety ii) accuracy iii) precision iv) aestheticism in works.

**Course outcomes:**

EEF102-1: Apply the principles of electricity in different applications.

EEF102-2: Solve simple resistive networks in electrical engineering applications.

EEF102-3: Use by calculations relevant capacitors in electric circuits.

EEF102-4: Apply the principles of electromagnetism due to conductors and coils with currents

EEF102-5: Solve magnetic circuits used in electrical machine/device applications.

EEF102-6: Use the principles of electromagnetic induction in electrical engineering applications



**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” : 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 Electrical equipment	PSO 2 Electrical power system
Competency: Apply the fundamental principles of electricity and magnetism to simple electrical engineering applications.	3	3	3	2	1	–	–	2	1	3	3	3
EEF102-1: Apply the principles of electricity in different applications.	3	3	3	2	1	–	–	2	1	3	3	3
EEF102-2: Solve simple resistive networks in electrical engineering applications.	3	3	3	2	1	–	–	2	1	3	3	3
EEF102-3: Use by calculations relevant capacitors in electric circuits.	3	3	3	2	1	–	–	1	1	3	3	3
EEF102-4: Apply the principles of electromagnetism due to conductors and coils with currents	3	3	3	2	1	–	–	2	1	3	3	3
EEF102-5: Solve magnetic circuits used in electrical machine/device applications.	3	3	3	1	1	–	–	1	1	3	3	3
EEF102-6: Use the principles of electromagnetic induction in electrical engineering applications	3	3	3	1	1	–	–	2	1	2	3	3



Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
2	<b>Resistive Networks:</b> 2.1 Ohm's Law, Concept of Voltage drop and Terminal Voltage. 2.2 Revision of resistance in series and parallel 2.3 Concept of voltage and current division and its Calculations. 2.4 Star Delta conversion of resistive networks 2.5 Calculations of Equivalent Resistance of simple Series, Parallel , Series Parallel Circuits and star-delta network (Simple Numerical)	8	10  (5)  (5)
<i>CO: EE102-3: Use by calculations relevant capacitors in electric circuits.</i>			
3.	<b>Capacitors:</b> 3.1 Concept and Definition of Capacitance 3.2 Construction & development of Capacitance in dielectrics. 3.3 Parallel Plate Capacitor - Uniform Di-electric Medium - Di-electric Medium Partly Air. - Composite Di-electric Medium. - Di-electric Medium in series across conducting parts(Simple Numerical) 3.4 Capacitors in Series & Parallel 3.5 Calculations of Equivalent Capacitance of simple Series, Parallel and Series Parallel Combinations. (Simple Numerical) 3.6 Energy Stored in Capacitor. (No Derivation only Simple Numerical) 3.7 Charging and Discharging of Capacitor (volt/current/charge versus time curves) (No Derivation only Simple Numerical) 3.8 Concept of Breakdown Voltage and Di-electric strength 3.9 Types of Capacitors and their Applications. Electrolytic , Non-Electrolytic (Paper, Mica, Plastic)	10	14  (4)  (4)  (6)

## Section II

Sr. No.	Topics / Subtopics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CO: EE102-4: Apply the principles of electromagnetism due to conductors and coils with currents.</i>			
4	<b>Electromagnetism</b> 4.1 Concept of Magnetic Field (definitions & relations of terms) 4.1.1 Magnetic Flux 4.1.2 Magnetic Flux Density 4.1.3 Magnetic field due to a Current carrying Conductor 4.1.4 Direction of Magnetic Field- Right hand rule, Cork Screw rule 4.1.5 Permeability 4.1.6 Relation between Magnetic flux Density and Field Intensity 4.2 Magnetic field due to Infinite Linear current carrying conductor (expression) 4.3 Magnetic field due to current carrying Circular Loop(Single turn coil)	10	12  (4)  (4)

[illegible]

**B. Specification table for setting question paper for semester end theory examination**

Section /Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Electricity Concepts	8	6	2	16	EEF102-1
I / 2	Resistive Networks	4	2	4	10	EEF102-2
I / 3	Capacitors	4	4	6	14	EEF102-3
II / 4	Electromagnetism	6	2	4	12	EEF102-4
II / 5	Magnetic Circuits	6	2	4	12	EEF102-5
II / 6	Electromagnetic Induction	8	2	6	16	EEF102-6

**C. TERMWORK****Laboratory experiences and related skills developed.**

Sr. no	Laboratory experience	Skills developed	CO
1	Study the effect of temperature on resistance of copper	1) Connect the various components as per the circuit diagrams by using wires 2) Calculate the resistance from the readings	EEF102-1
2	Use of Rheostat as a current regulator & potential divider	1) Use the rheostat as a current regulator i.e. change the current in the circuit 2) Use the rheostat as a potential divider i.e. change the voltage across the circuit.	EEF102-2
3	To verify current division & voltage division in series & parallel resistive circuit.	1) Connect the various components as per the circuit diagrams by using wires. 2) Verify current & voltage division.	EEF102-2
4	To plot the charging and discharging curves of a capacitor and determine the time constant.	1) Connect the various components as per the circuit diagrams by using wires 2) Plot the charging & discharging curves from the readings 3) Determine the time constant of given circuit.	EEF102-3
5	To plot the B H curve for magnetic material and determine the relative Permeability	1) Connect the various components as per the circuit diagrams by using wires 2) Plot the B-H curve from the readings 3) Determine the relative Permeability of the material.	EEF102-4 to 5
6	To verify Faraday's First Law of electromagnetic Induction (For Dynamically & Statically Induced EMF)	1) Connect the apparatus as per the circuit diagrams . 2) Observe the deflection of galvanometer with respect to magnitude & direction. 3) Analyze the observations.	EEF102-4 to 6

**D. Instructional strategies:**

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

**E. Teaching and Learning resources, including references:**

- 1) Chalk-board.
- 2) Demonstrative kits.
- 3) Demonstrative charts.

Books:

<b>Sr. No.</b>	<b><i>Name of Book</i></b>	<b><i>Author</i></b>	<b><i>Publisher</i></b>
1.	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.)	B. L. Theraja A. K. Theraja	S. Chand and Co.
2.	Basic Electrical Engg.	V. N. Mittle	Tata McGraw-Hill
3.	Electrical Technology	Edward Hughes	Pearson Education, New Delhi
4	Electrical Technology	V.K.Mehta	S. Chand and Co.

Websites:

1. [www.google.co.in](http://www.google.co.in)
2. [www.electrical4u.com/](http://www.electrical4u.com/)
3. [electrical-engineering-portal.com](http://electrical-engineering-portal.com)
4. [www.nptel.org.in](http://www.nptel.org.in)

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**COURSE ID :****Course Name : WORKSHOP PRACTICES (EE)****Course Code : EF103****Course****Abbreviation :FEWS****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	Each two tests of 20 marks Average of	i) 25 marks for each practical ii) One PST of 25 marks	Term End (03 hours) Theory Exam	III Proforma As per	--	
Marks	Nil	--	-	50	--	50

**RATIONALE:****Work shop practices mainly deals with wood working ,sheet metal and welding.**

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, Sheet metal and Welding technique.****Cognitive : Understand different practices in wood working, sheet metal welding shop.****Psychomotor : Prepare a simple job in wood working, sheet metal and welding trade.****Affective : Develop attitude of i) Interpret drawing ii) Safety practices****COURSE OUTCOMES :****EEF103-1** Select different types of tools used in Wood working, Welding, Sheet metal.

**EEF103-2** Prepare a simple job in all above trades.

**EEF103-3** Select various types of materials used in Wood working, Sheet metal and Welding.

**EEF103-4** Interpret drawing.

**EEF103-5** 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	O 1 Basic knowledge	O 2 discipline knowledge	O 3 experiment and practice	O 4 engineering tools	O 5 the engineer and society	O 6 environment and sustainability	O 7 ethics	O 8 individual and team work	O 9 communication	O 10 life-long learning	SO 1 Work in mfg & service sector	SO 2 Acquaintance with current technology	SO 3 Pursue higher educational activity	SO 4 Start entrepreneurial activity
Competency:	1	-	3	-	-	-	-	3	-	-	2	-	-	-
EEF103-1	1	-	3	-	-	-	-	3	-	-	2	-	-	-
EEF103-2	1	-	3	-	-	-	-	3	-	-	2	-	-	-
EEF103-3	1	-	3	-	-	-	-	3	-	-	2	-	-	-
EEF103-4	1	-	3	-	-	-	-	3	-	-	2	-	-	-
EEF103-5	1	-	3	-	-	-	-	3	-	-	2	-	-	-



**Course Contents :- TERM WORK**

<b>Sr. No.</b>	<b>Topics/ Sub-Topics</b>	<b>Practical (Hours)/ Evaluation (Marks)</b>	<b>Skills/ Competencies to be developed</b>	<b>Course outcome</b>
<b>1</b>	<b>Wood Working shop :-</b> a) Any one composite job from the following involving different operations, joints, turning & planning, surface finishing by emery paper, varnishing etc. i) Switch board. ii) Computer table. iii) Printer Table	10/15	a) Study of carpentry tools, Identifying materials b) Measuring dimensions c) Interpretation of drawing d) Operating planning, cutting, drilling machines e) Time management and observing safety habits f) Prepare furniture or article with carpentry joints	EEF 1 to EEF 5
<b>2</b>	<b>Sheet Metal Shop :</b> a) Demonstration of different sheet metal 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.	12/20	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	EEF 1 to EEF 5
<b>3</b>	<b>Welding shop :-</b> 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.	10/15	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	EEF 1 to EEF 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 :

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

##### **ii) Progressive Skill Test :**

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

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

#### **Instructional Strategies :-**

Demonstration of Practical.

Workshop Record Book, maintenance record book.

Workshop Journal.

#### **Teaching and learning resources:-**

Shop Demonstration

Hands on training on machine

#### **Reference Books :-**

<b>Author</b>	<b>Title</b>	<b>Publisher</b>
S. K. Hajra Chaudary, 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](http://www.egr.msu.edu/~pkwon/me478)

# **Level II**

## **(Life & Professional Skills Courses)**

**COURSE ID :**

**Course Name** : **GENERIC SKILLS**  
**Course Code** : **CCF201**  
**Course Abbreviation** : **FGNS**  
**Pre-requisite Course(s)** : **NIL**

**TEACHING AND EVALUATION SCHEME:****Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	02	04
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral Examination (Internal)	
Details of Evaluation	-	i.25 marks for each practical ii.One PST of 25 marks	--	As per Proforma-VI	As per Proforma-V	
Marks	-	--	-	25	50I	75

**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 Enlist and appreciate generic skills necessary for a technician

CCF201-2Attain concentration through thought analysis, omkar, pranayam, prayer and meditation

CCF201-3 Exhibit language skills viz. vocabulary, recitation, sentence making skills.

CCF201-4 Exhibit learning skills, studying skills and technical skills viz. calculating, graphic skills

CCF201-5 Exhibit aesthetic skills, behavioural skills and creativity skills

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

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

Competency and Cos	PO 1 Basic 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 Electric equipment	PSO2 Electric power systems
<b>Competency:</b> Apply generic skills to learn to achieve refinement in overall development of personality as follows:	2	2	3	—	1	—	2	2	2	3	—	—
CCF201- Enlist and appreciate generic skills necessary for a technician	2	2	1	—	2	—	—	2	2	2	—	—
CCF201-2 Attain concentration through thought analysis, omkar, pranayam, prayer and meditation	2	2	2	—	2	1	1	2	2	2	—	—
CCF201-3 Exhibit language skills viz. vocabulary, recitation, sentence making skills	2	2	2	—	2	—	2	2	2	2	—	—
CCF201-4 Exhibit learning skills, studying skills and technical skills viz. calculating, graphic skills	2	2	2	—	2	—	2	2	2	2	—	—
CCF201-5 Exhibit aesthetic skills, behavioral skills and creativity skills	2	1	1	—	1	—	1	2	2	2	—	—

## CONTENT:

### A: THEORY :

Sr. No.	Topics / Sub-topics	Lectures (Hours)
CCF201-1 Enlist and appreciate generic skills necessary for a technician		
<b>1</b>	<b>Overview of generic skills</b> 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	<b>02</b>
CCF201-2 Attain concentration through thought analysis, omkar, pranayam, prayer and meditation		
<b>2</b>	<b>Concentration Skills</b> 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 <i>pranayam</i> 2.4 Concentration skills : Chanting <i>omkar</i> 2.5 Concentration skills : Prayer - Daily input of positive Thoughts 2.6 Concentration skills : Meditation	<b>06</b>
CCF201-3 Exhibit learning skills, studying skills and technical skills viz. calculating, graphic		
<b>3</b>	<b>Learning Skills</b> <b>3.1 Fundamentals of Learning :</b> Definition, characteristics and rewards of learning. Affective, cognitive and psychomotor domains of learning. Barriers in learning. FIPN analysis. <b>3.2 Process of Learning :</b> Reception, understanding, consolidation, retrieval, internalization, application, reinforcement and enhancement <b>3.3 Learning Skills:</b> Skills of observing, listening, reading, notes taking, memorizing, problem solving, graphic, experimenting, surveying, calculating skills, Cognitive skills. <b>3.4 Studying skills :</b> Planning and scheduling, Methods of study as per	<b>08</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)
	nature of subject content. <b>3.5 Self-motivation:</b> Meaning and importance. Improving self-motivation through activities like inspiring case studies, web search & presentation, technical quiz/games, group studying, making videos, industry exposure	
CCF201-4 Exhibit language skills viz. vocabulary, recitation, sentence making skills.		
<b>4</b>	<b>Language Skills</b> 4.1 Vocabulary. Pronunciation. Spellings. Recitation. 4.2 Listening and recitation 4.3 Elements of grammar: common rules. Comprehension. Expressing self. 4.4 Word games	<b>06</b>
CCF201-5 Exhibit aesthetic skills, behavioural skills and creativity skills		
<b>5</b>	<b>Aesthetic Skills</b> 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	<b>02</b>
<b>6</b>	<b>Behavioral Skills</b> 6.1 Manners and etiquettes. Discipline. Sincerity. Morales. Politeness. Social and civic sense. Assertion without aggression.	<b>04</b>
<b>7</b>	<b>Creativity Skills</b> 7.1 Meaning and importance of creativity. 7.2 Doing things creatively.	<b>04</b>
	<b>TOTAL</b>	<b>32</b>

## B: 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 to be developed
1.	Introduction Game	Self-expression, inter-personal rapport
2.	Concentration Skills - 1: Chanting of Omkar	Concentration
3.	Concentration Skills - 2: Breathing exercises	Concentration
4.	Concentration Skills - 3: Prayer	Concentration, recitation, positive thinking
5.	Concentration Skills - 4: Meditation	Concentration, thought management
6.	Language Skills - 1 : Vocabulary Exercise	Vocabulary improvement
7.	Language Skills - 2 : Recitation Exercise	Pronunciation, language acquaintance
8.	Language Skills - 3 : Grammar	Language skills
9.	Learning Skills - 1 : Domain Analysis of an activity	Understanding learning domains
10.	Learning Skills - 2 : FIPN Analysis of Learning	Learning analysis
11.	Learning Skills - 3 : Reading and Notes taking	Effective reading and notes taking
12.	Learning Skills - 4 : Listening and Notes taking	Effective listening and notes taking
13.	Learning Skills - 5 : Studying Skills	Effective self-studying
14.	Technical Skills - 1 : Calculating Skills	Efficient use of calculator
15.	Technical Skills - 1 : Text-graphic Conversion	Graphic and language skills
16.	Aesthetic Skills	Attitude of aesthetic presentation
17.	Behavioral Skills	Behavior, mannerism and etiquettes
18.	Creativity Skills	Attitude of creativity and innovation
19.	Self-motivated Activities	Self-motivation Skills

**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

**D. ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION****Term work :****i) Continuous Assessment of Practical Assignments:**

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

**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*

**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 >	Concentration 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

**F. 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

**G. 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](http://www.mindtools.com)
- ii) [www.samcerto.com](http://www.samcerto.com)
- iii) [www.stress.org.uk](http://www.stress.org.uk)
- iv) [www.yogapoint.com](http://www.yogapoint.com)

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**COURSE ID:**

<b>Course Name</b>	<b>: COMMUNICATION SKILLS</b>
<b>Course Code</b>	<b>: CCF202</b>
<b>Course Abbreviation</b>	<b>: FCMS</b>
<b>Pre-requisite Course(s)</b>	<b>: &lt; nil &gt;</b>

**TEACHING AND EVALUATION SCHEME:****Teaching Scheme:**

<b>Scheme component</b>	<b>Hours / week</b>	<b>Credits</b>
Theory	02	04
Practical	02	

**Evaluation Scheme :**

<b>Mode of Evaluation</b>	<b>Progressive Assessment</b>		<b>Term End Examination</b>			<b>Total</b>
	Theory	Practical	Theory Examination	Term Work	Pract. Examination (Internal)	
<b>Details of Evaluation</b>	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-II	
<b>Marks</b>		--	<b>50</b>	-	<b>25 I</b>	<b>75</b>

I – Internal Examination

**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 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	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 Electric equipment	PSO2 Electric power systems
<b>Competency</b> Apply principles of communication to communicate in formal and informal scenario	3	2	3	–	2	2	2	3	3	2	1	1
CCF202-1 Identify his/her communication barrier	2	2	2	–	–	–	–	–	2	2	1	1
CCF202-2 converse and convince by speaking, deliver prepared & extempore speech	3	2	3	–	2	–	2	2	3	3	–	1
CCF202- write letters, reports, resume in correct language	2	2	3	–	2	2	1	3	2	3	2	2
CCF202-4 Make effective use of body language & graphic communication	2	2	2	–	2	–	2	2	2	2	2	2
CCF202-5 Prepare and present simple media aided presentation	2	2	2	–	–	–	–	1	2	2	1	1
CCF202-6 Prepare and face mock interview	2	2	3	–	2	–	–	3	2	2	1	1

**CONTENT:****A. THEORY :**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
CCF202-1 Identify his/her communication barriers			
<b>1</b>	<b>Fundamentals of Communication</b> 1.1 Definition of communication by Newman and Peter Little. Importance communication 1.2 Model of 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
CCF202-2 Converse and convince by speaking, deliver prepared & extempore speech			
<b>2</b>	<b>Oral Communication</b> 2.1 Principles and characteristics of oral communication. 2.2 Tone, pronunciation and accents. Grammar. 2.3 Spoken English : Dialogue, conversation, prepared and extempore speech, discussion, debate, feedback	06	08
CCF202-3 Write letters, reports, resume in correct language			
<b>3</b>	<b>Written Communication</b> 3.1 Principles and characteristics of written communication 3.2 Grammar : (Tense, Articles, Prepositions, Change the Voice, Direct and Indirect Speech)	06	08

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	3.3 Writing reports, letters, small essays, resume, paper, seminar, notes		
CCF202-4 Make effective use of body language & graphic communication			
<b>4</b>	<b>Non-verbal communication</b> 4.1 Principles and characteristics of non-verbal Communication. 4.2 Body Language: visual, tactile, auditory, cultural. Silence. 4.3 Graphic Communication : Visual illustration, technical graphic communication.	04	08
CCF202-5 Prepare and present simple media aided presentation			
<b>5</b>	<b>Media Aided Presentation</b> 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	08
CCF202-6 Prepare and face mock interview			
<b>6</b>	<b>Interview Techniques</b> 6.1 Preparing for an interview 6.2 Taking a mock interview and facing an interview	04	06
	<b>Total</b>	<b>32</b>	<b>50</b>

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

Topic No.	Name of topic	Distribution of marks			Total marks	
		Remember	Understand	Apply		
1	Fundamentals of Communication	02	06	04	12	CCF202-1
2	Oral Communication	02	02	04	08	CCF202-2
3	Written Communication	02	02	04	08	CCF202-3
4	Non-verbal Communication	02	02	04	08	CCF202-4
5	Media aided presentation	02	02	04	08	CCF202-5
6	Interview Techniques	00	02	04	06	CCF202-6
	Total >>	10	16	24	50	

**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 *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
1.	Characteristics of Communication Process	Analysis of communication process
2.	My Communication Barriers	Self analysis
3.	Verbal Communication : Vocabulary	Improvement in vocabulary
4.	Grammar and Pronunciation Tips	Grammar and pronunciation

5.	Oral Communication : Prepared Speech	Preparing and delivery
6.	Oral Communication : Extempore Speech	Creative thinking and speaking
7.	Oral Communication : Conversation	Listening, thinking and speaking
8.	Oral Communication : Group Discussion	Listening, thinking and convincing
9.	Oral Communication : Group Debate	Listening, thinking and convincing
10.	Written Communication : Drafting Skills	Drafting
11.	Written Communication : Writing formal and Informal Letters	Drafting
12.	Written Communication : Writing Reports	Drafting with comprehension
13.	Written Communication : Writing Scripts	Drafting
14.	Non-verbal Communication : Graphic Communication	Graphic skills
15.	Non-verbal Communication : Body Language	Body language
16.	Using Presentation Aids	Using presentation aids
17.	Interview Techniques	Facing interview

**C. 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

**D . 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 25 marks as per criteria given in *Workbook on Communication Skills*.

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

**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

**E.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

**F.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	Nirali Prakashan
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](http://www.clrp.cornell.edu/workshops/pdf/communication_skills-web.pdf)
- ii) [http://depssa.ignou.ac.in/wiki/images/c/ca/Communication\\_skills\\_in\\_English.pdf](http://depssa.ignou.ac.in/wiki/images/c/ca/Communication_skills_in_English.pdf) www
- iii) <http://www.cgg.gov.in/Handbook%20on%20Communication%20Skills.pdf>
- iv) <http://www.stf-media.com/31-0-Presentations.html>

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**COURSE ID:**

Course Name	: PROFESSIONAL PRACTICES
Course Code	: CCF203
Course Abbreviation	: FPRP
Pre-requisite Course(s)	: NIL

**TEACHING AND EVALUATION SCHEME:****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	01	03
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (Internal)	
Details of Evaluation	-	i. 25 marks for each practical ii. One PST of 25 marks	Term End Theory Exam (03 hours)	As per Proforma-VI	As per Proforma-V	
Marks	-	--	-	25	50I	75

**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 principles of organizational behavioural science for professional skills as follows :

**Cognitive :** Understanding and applying principles of effective technical communication

**Psychomotor :** i) Speaking skills ii) writing skills iii) Body language skills

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

**COURSE OUTCOMES :**

CCF203-1 Develop awareness about industrial scenario of world and India

CCF203-2 Develop professional skills like leadership, stress and conflict management, team building skills

CCF203-3 Develop awareness about major industrial projects and biographies of great industrial personalities

**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	PSO1 Electrical equipment	PSO2 Electrical power systems
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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	PSO1 Electrical equipment	PSO2 Electrical power systems
<b>Competency:</b> Apply principles of organizational behavioral science for professional skills	3	3	3	2	2	-	3	1	1	1	3	3
CCF203-1 Develop awareness about industrial scenario of world and India	3	3	-	-	2	-	3	1	1	2	2	2
CCF203-2 Develop professional skills like leadership, stress and conflict management, team building skills	3	3	3	3	2	-	3	1	1	2	2	2
CCF203-3 Develop awareness about major industrial projects and biographies of great industrial personalities	2	3	3	1	1	-	3	1	1	1	3	3

**CONTENT:****A. THEORY :**

Sr. No.	Topics / Sub-topics	Lectures (Hours)
CCF203-1 Develop awareness about industrial scenario of world and India		
<b>1</b>	<b>Industrial Development of India</b> 1.3 Introduction to industrial revolution in the world 1.4 Brief history of industry in India 1.5 Broad categories of industries : Manufacturing industry, service industry 1.6 Present industrial scenario of India : Small scale, medium scale and major industries in the programme discipline 1.7 Major issues related to industrialization	<b>04</b>
CCF203-2 Develop professional skills like leadership, stress and conflict management, team building skills		
<b>2</b>	<b>Profession and Professional Skills</b> 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.	<b>06</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)
	Methods of resolution - negotiating, compromising, withdrawal, forcing, engagement 2.5 Self SWOT analysis as a professional technician 2.6 Aptitude test	
CCF203-3 Develop awareness about major industrial projects and biographies of great industrial personalities		
<b>3</b>	<b>Industrial Personalities and Major Projects</b>  a. Pioneers of Industrial development of India : Brief biography of Sir M. Visvesvaraya and JRD Tata b. Biography and contribution of two great industrial personalities from programme discipline c. Study of 5 major technological projects in the programme discipline	<b>06</b>
	<b>Total</b>	<b>16</b>

## B.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	Course outcomes
1.	Information Search through internet on Industrial Scenario of India	Information search and interpretation skills	CCF203-01
2.	Information Search through actual visit to MIDCs on classification of industries	Information search and interpretation skills	CCF203-01
3.	Biography and contribution of Sir M. Visvesvaraya and J.R.D.Tata	Information search and presentation skills	CCF203-3
4.	Biography and contribution of two eminent industrialists from programme discipline	Information search and presentation skills	CCF203-3
5.	Individual SWOT analysis as a professional technician	Self-analysis skills	CCF203-2
6.	Leadership	Leadership skills	CCF203-2
7.	Stress and Conflict Management	Stress and conflict management skills	CCF203-2
8.	Aptitude test	Self-testing skills	CCF203-3
9.	Case study of a major technological project in the programme discipline	Case study 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

**D.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 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*.**b)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).**E. INSTRUCTIONAL STRATEGIES:****Instructional Methods:**

1. Lectures cum Demonstrations
2. Classroom practices

**Teaching and Learning resources:**

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

**F. 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**

- en.wikipedia.org/wiki/Leadership*

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**(Level III  
Basic Technology Courses)**

**Course ID :**

**Course Name** : Applied Mathematics  
**Course Code** : EEF301, ETF301, IEF301, ITF301  
**Course Abbreviation** : FAMT  
**Pre-requisite Course(s)** : CCF106

**Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	04
Tutorial	01	

**Evaluation Scheme :**

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

**Rationale:**

Mathematics is an important 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. The fundamentals of these topics are directly useful in understanding engineering applications in various fields.

**Competency:**

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

1. Cognitive: understanding principles of mathematics to engineering problems
2. Psychomotor: use integration for electrical engineering applications.
3. Attitudes: discipline, consistency, hard work, concentration, accuracy and punctuality.

**Course Outcomes (CO's)**

**EEF301.1** Apply the concept of integration to find the area ,Mean value and Root Mean Square values

**EEF301.2** Solve Differential equation of first order and first degree by various methods and use it to solve various geometrical problems and application to rate and motion of a particle

**EEF301.3** Solve examples of complex numbers and hyperbolic functions

**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	PSO1 Electrical equipment	PSO2 Electrical power system
EEF301-01	3	2	3	2	-	-	1	2	1	3	2	2
EEF301-02	3	2	3	-	-	-	1	1	1	3	2	1
EEF301-03	3	2	2	-	-	-	1	1	1	3	1	1
EEF301-04	3	2	3	2	-	-	1	2	1	3	2	2
EEF301-05	3	2	3	2	-	-	1	1	1	3	2	1
EEF301-06	3	2	2	2	-	-	1	1	1	3	2	2

**Content :****A) Theory :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEF301-01 Apply the concept of integration to find the area ,Mean value and Root Mean Square values			
<b>1</b>	Indefinite Integrals Definition, Standard formulae 1.1 Rules of Integration(without proof), Examples 1.2 Integration by substitution, 1.3 Integration by parts, 1.4 Integration by partial fractions	<b>12</b>	<b>20</b>
EEF301-01 Apply the concept of integration to find the area ,Mean value and Root Mean Square values			
<b>2</b>	Definite Integrals 2.1 Definition, Examples 2.2 Properties of Definite Integration ( without proof), Examples based on properties	<b>06</b>	<b>10</b>
EEF301-01 Apply the concept of integration to find the area ,Mean value and Root Mean Square values			
<b>3</b>	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	<b>06</b>	<b>10</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

**Section II**

<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>	<b>Theory Evaluation (Marks)</b>
<b>EEF301-02 Solve Differential equation of first order and first degree by various methods</b>			
<b>4</b>	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	<b>08</b>	<b>16</b>
<b>EEF301-02 Solve Differential equation of first order and first degree by various methods and use it to solve various geometrical problems and application to rate and motion of a particle</b>			
<b>5</b>	Applications of Differential Equations 5.1 Geometrical application-To find equation of curve 5.2 Application to rates-Displacement, velocity and acceleration of a moving particle	<b>04</b>	<b>04</b>
<b>EEF301-03 Solve examples of complex numbers and hyperbolic functions</b>			
<b>6</b>	Complex numbers 6.1 Definition , Algebra of complex numbers , simple examples 6.2 Argand diagram , Polar form ;Exponential form; 6.3 De-Moivre's Theorem, Roots of a complex number 6.4 Euler's Theorem 6.5 Hyperbolic functions ,Relation between trigonometric function and hyperbolic function 6.6 separation into real and imaginary parts	<b>12</b>	<b>20</b>
<b>Total</b>		<b>24</b>	<b>40</b>

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

<b>Topic No.</b>	<b>Name of topic</b>	<b>Distribution of marks (level wise)</b>			<b>Course Outcome</b>	<b>Total Marks</b>
		<b>Remember</b>	<b>Comprehension</b>	<b>Application</b>		
1	Indefinite Integrals	4	6	10	EEF-01	20
2	Definite Integrals	2	2	6	EEF-01	10
3	Application of Integration	--	--	10	EEF-02	10
4	Differential equations	2	4	10	EEF-02	16
5	Application of diff. equations	--	--	04	EEF-03	04
6	Complex Numbers	4	4	08	EEF-03	20

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

**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)	
1	Indefinite Integrals	To evaluate Integration using standard formulae, To evaluate Integration using Substitution Method	EEF-01
2	Indefinite Integrals	To evaluate Integration of Various forms.	EEF-01
3	Indefinite Integrals	To evaluate Integration using by Parts rule and Partial fraction method	EEF-01
4	Definite Integrals	To evaluate Define Integration for various forms and using properties.	EEF-01
5	Application of Integration	Apply Integration concepts to find Area ,Mean value, RMS value.	EEF-02
6	Differential equations	To determine Order and Degree of D.E.. Examples on V.S. form , Homogeneous form	EEF-02
7	Differential equations	Examples on Linear of D.E and Exact D.E.	EEF-02
8	Application of D.E.	Examples on Rates and geometrical applications	EEF-02
9	Complex numbers(1)	Examples of complex numbers	EEF-03
10	Complex numbers(2) Hyperbolic functions	Examples of hyperbolic functions	EEF-03

**Instructional 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	Engg Mathematics III	PhadakePrakashan, Kolhapur
2.	Patel, Rawal,	Applied Mathematics	NiraliPrakashan,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 vidyarthiGriha Prakashan ,
6	H.K.Dass	Higher engineering mathematics	S .Chand publication
7	B.S.Grewal	Higher engg Maths	Khanna publication, New Delhi

**b) Website**

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

**COURSE ID :**

**Course Name : ELECTRIC CIRCUITS**  
**Course Code : EEF302**  
**Course Abbreviation : FECT**  
**Pre-requisites : EEF102**

**Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	03	06
Practical	02	
Tutorial	01	

**Evaluation Scheme:**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i. 50 marks for continuous assessment. ii. One PST of 50 marks.	Term End Theory Exam (03 hours)	As per Proforma VI	As per relevant Proforma IV	
Marks	20	-	80	25	50 E	175

**Rationale:**

Electrical technicians working in the field/industry have to deal with applications that require them to be well conversant with the concepts of electrical parameters such as resistance, inductance and capacitors. The combination of these parameters in DC and AC circuits give rise to the different applications of electrical engineering. This course deals with these parameters and their behavior under different source conditions.

**Competency:** The aim of this course is to inculcate the following skills in the electrical technician;

**Solve different electric application networks.**

**Cognitive:** i) Understand the working of DC and AC electric circuits.

**Psychomotor :** i) Use the relevant tools and accessories in electrical engineering to connect components.

**Affective :** Attitude of i) safety ii) accuracy iii) precision iv) aestheticism in works.

**Course outcomes:**

**EEF302-1.** Apply electrical network theorems to solve dc circuits.

**EEF302-2.** Solve for ac circuit quantities of voltage, current and different factors.

**EEF302-3.** Solve ac series circuits including resonant ones.

**EEF302-4.** Solve ac parallel circuits including resonant ones.

**EEF302-5.** Apply network theorems to solve ac circuits.

**EEF302-6.** Solve three phase star and delta circuits for voltage, current, powers and power factors.

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

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” : no correlation ]

Semester III 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 system
<b>Competency:</b> Solve different electrical application networks	3	1	3	1	1	–	–	2	1	2	3	3
EEF302-1: Apply electrical network theorems to solve dc circuits	3	2	3	1	1	–	–	2	1	2	3	3
EEF302-2: Solve for ac circuit quantities of voltage, current and different factors.	3	2	3	2	1	–	–	2	1	3	3	3
EEF302-3: Solve ac series circuits including resonant ones.	3	2	3	2	1	–	–	2	1	2	3	3
EEF302-4: Solve ac parallel circuits including resonant ones.	3	2	3	1	1	–	–	2	1	2	3	3
EEF302-5: Apply network theorems to solve ac circuits.	3	2	3	1	1	–	–	2	1	2	3	3
EEF302-6: Solve three phase star and delta circuits for voltage, current, powers and power factors.	3	2	3	1	1	–	–	2	1	2	3	3

**CONTENTS:****A) THEORY****Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>CO: EEF302-1: Apply electrical network theorems to solve dc circuits</i>			
<b>1</b>	<b>Network theorems (DC Circuits).</b> 1.1 Basics of DC Circuits (Kirchhoff's laws). 1.2 Maxwell loop analysis (two loop), Nodal Analysis up to two nodes. 1.3 Star–delta connection of resistances and their Transformations (Derivation & Numerical) 1.4 Superposition Theorem & its application up to two loop circuits.( Numerical) 1.5 Thevenin's theorem & its applications up to two loop circuits. (Numerical) 1.6 Norton's theorem and its applications up to two loop circuits.( Numerical) 1.7 Maximum Power Transfer theorem and its applications up to two loop Circuits. (Numerical)	08	16

<i>CO: EEF302-2: Solve for ac circuit quantities of voltage, current and different factors</i>			
<b>2</b>	<b>A.C. Fundamentals.</b> 2.1 Generation of Alternating Current and Voltage, elementary alternator. 2.3 Some important terms: waveform, peak/maximum value, average value, effective/RMS value, peak factor, importance of form factor, phase and phase difference. 2.4 Equations of Alternating Voltages and Currents. 2.5 Phasor diagram representation of alternating quantities. 2.6 Addition and subtraction of sinusoidal alternating quantities. 2.7 Numerical on 2.3 to 2.6.	08	12
<i>CO: EEF302-3: Solve ac series circuits including resonant ones</i>			
<b>3</b>	<b>A.C. Series Circuits:</b> 3.1 Phasor algebra: simple addition/subtraction 3.2 Rectangular and polar forms of vectors with conversions from one form to other. 3.3 Solve ac circuits containing pure resistance, pure inductance, pure capacitance and their combinations in series. 3.6 calculations of active power, reactive power, apparent power and power factor. 3.7 Series resonance phenomena, calculation of resonant frequency, current at resonance, power factor, quality factor & band width. 3.8 Numerical examples on above	08	12
		24	40

**Section –II**

Sr. no.	Topics/Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>CO: EEF302-4: Solve ac parallel circuits including resonant ones</i>			
<b>4</b>	<b>A. C. Parallel Circuit</b> 4.1 Calculation of currents and powers. 4.2 Phasor diagrams (Numerical problems up to three parallel branches). 4.3 Resonance, resonant frequency, current, power factor, quality factor with numerical treatment.	06	10
<i>CO: EEF302-5: Apply network theorems to solve ac circuits</i>			
<b>5</b>	<b>AC network solutions</b> 5.1 Statements of laws and theorems (Kirchhoff's laws, Superposition Theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem) as applicable to ac networks.	08	14



	5.2 Numerical solutions of two loop ac circuits using the theorems.		
<i>CO:EEF302-6: Solve three phase star and delta circuits for voltage, current, powers and power factors</i>			
6	<b>Three phase A. C. Circuits</b> 6.1 Polyphase system 6.2 Generation of three phase voltages. 6.3 Three phase three wire and four wire supply systems. 6.4 Balanced supply systems and balanced loads. 6.5 Voltage, current, power relations along with calculations in star and delta connection. 6.6 Calculation of apparent power, active power and reactive power. 6.7 Importance of power triangle. 6.8 Applications of star and delta connections.	10	16
		24	40

**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
		Knowledge	Comprehension	Application		
I / 1	Network theorems (DC Circuits)	2	6	8	EEF302-1	16
I / 2	A.C. Fundamentals	2	4	6	EEF302-2	12
I / 3	A.C. Series Circuit	2	4	6	EEF302-3	12
II / 4	A. C. Parallel Circuit	2	4	4	EEF302-4	10
II / 5	A. C. network solutions	2	4	8	EEF302-5	14
II / 6	Three phase A.C. Circuits	2	6	8	EEF302-6	16

**B) Practicals:**

Sr. no	List of practicals	CO
1	Verify Super position Theorem	EEF302-1,5
2	Verify Thevenin's Theorem	EEF302-1,5
3	Verify Norton's Theorem	EEF302-1,5
4	Verify Maximum power Transfer Theorem	EEF302-1,5
5	Verify behavior of R – L Series Circuit	EEF302-2,3

Sr. no	List of practicals	CO
6	Verify behavior of R – C Series Circuit .	EEF302-2,3
7	Verify behavior of R – L - C Series Circuit	EEF302-2,3
8	Verify behavior of A. C. Parallel Circuit	EEF302-2,4
9	Verify relationship between Line & phase voltage & current in Star connection	EEF302-6
10	Verification of relationship between Line & phase voltage & current in Delta connection	EEF302-6

**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
	Total	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.

**Reference Books:**

- 1) Electrical Technology - by Edward Hughes.
- 2) Electrical Technology - by B.L. Theraja vol. I
- 3) Basic Electrical Engineering - by V.N. Mittal.
- 4) Electrical Technology - B.H. Deshmukh.
- 5) Electrical Technology - by V.K. Mehta.
- 6) Basic Electrical Engineering - by Nagrath

**Websites**

- [www.google.com](http://www.google.com),
- [www.wikipedia.com](http://www.wikipedia.com),
- [www.youtube.com](http://www.youtube.com),
- [www.khanacademy.com](http://www.khanacademy.com)

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**COURSE ID :**Course Name : **Basic Electronics**Course Code : **EEF303**Course Abbreviation : **FBET**Pre-requisite Course(s) : **NIL****Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	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 -III	-	
Marks	20	--	80	25	-	125

**Rationale:**

Now a days electronics circuits are most widely used in industries, Power Systems, Communication systems etc. Knowledge of various types of electronic components, circuits & their applications is absolutely necessary for every engineer. The basic prerequisite for conceptual understanding of the operation of the electronic systems is understanding the basic devices in electronic circuits, which forms the subject matter of this course.

**Course Competency:** Use the fundamental principles of electronics in relevant applications.

**Course Outcomes:**

EEF 303.1. Use the relevant semiconductor diodes in electronic applications.

EEF 303.2. Use & maintain different types of solid state DC power supplies.

EEF 303.3. Apply transistor circuit in various electronics applications.

EEF 303.4. Work out logic gates using the relevant approach.

EEF 303.5. Implement electronic circuits using photo devices.

EEF 303.6. Work out PCB design using the relevant approach.

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

[ Note : Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Use the fundamental principles of electronics in relevant applications.	3	3	3	3	3	-	-	3	3	3	3	3
303.1. Use the relevant semiconductor diodes in electronic applications.	2	2	3	1	3	-	-	1	2	3	1	1
303.2. Use & maintain different types of solid state DC power supplies.	3	2	2	1	2	-	-	1	2	2	1	1
303.3. Apply transistor circuit in various electronics applications	3	2	2	1	2	-	-	2	2	2	2	2
303.4. Work out logic gates using the relevant approach.	2	2	2	1	2	-	-	2	2	2	2	1
303.5 Implement electronic circuits using photo devices.	3	3	2	1	2	-	-	2	2	2	1	1
303.6 Work out PCB design using the relevant approach.	3	3	2	3	2	-	-	3	3	3	2	2

## A] CONTENTS:

### Section I

Sr. no	Topics / sub-topics	Teaching Hours	Theory evaluation marks
<i>EEF303-01: Use the relevant semiconductor diodes in electronic applications.</i>			
1	<b>Semiconductor Diode</b> 1.0 P.N. junction diode – Ge & Si 1.01 Constructional features. 1.02 Operating principle. 1.03 Characteristics. 1.04 Applications. 1.05 Specifications. 1.1 Zener diode 1.1.1 Constructional features. 1.1.2 Operating principles. 1.1.3 Characteristics 1.1.4 Specifications. 1.1.5 Applications such as Zener diode as a voltage regulator	10	14
<i>EEF303-02: Use &amp; maintain different types of solid state DC power supplies.</i>			

2	<b>D.C. Power Supply</b> 2.1 Rectifiers- Half wave/ full wave/ Bridge 2.1.1 Working Principles 2.1.2 Average value 2.1.3 Ripple factor 2.1.4 Rectifier efficiency 2.2 Filters 2.2.1 Series inductor filter 2.2.2 Shunt capacitor filter 2.2.3 LC & CLC filter 2.3 Voltage Regulators 2.3.1 Transistor Series voltage Regulator 2.3.2 Transistor Shunt voltage Regulator.	08	14
<i>EEF303-03: Apply transistor circuit in various electronics applications</i>			
3	<b>Bipolar Junction Transistor</b> 3.1 Bipolar Junction Transistor (BJT) 3.1.1 Introduction. 3.1.2 Constructional features. 3.1.3 Operating principles of NPN & PNP Transistor 3.2 Modes of operation. 3.3 Switching action of transistor 3.4 CB, CE & CC configurations 3.5 Specifications of transistor	06	12
		24	40

## Section II

Sr. no	Topics / sub-topics	Teaching Hours	Theory evaluation marks
<i>EEF303.4. Work out logic gates using the relevant approach.</i>			
4	<b>Logic Gates</b> 3.1 Symbols & Truth Tables of following logic gates AND, OR, NOT, NAND, NOR, EXOR 3.2 Boolean Algebra 3.2.1 Boolean operators 3.2. 2 Reduction of expressions 3.2. 3 De-Morgan's theorems 3.2. 4. Products of sum ( POS ) & 3.2. 5. Sum of products ( SOP ) 3.2. 6 Karnaugh's Maps reduction techniques up to two variables	10	14
<i>EEF303-05: Implement electronic circuits using photo devices .</i>			
5	<b>Photo Devices</b> 5.1 Principle of photo electric emission 5.2 Construction and working of LDR, photodiode, Photo transistor, LASCR 5.3 Applications of photo devices such as 1) Burglar alarm 2) Photo tachometer 3) Batch counter 5.4 Opto-couplers : specifications, uses	10	14

**EEF303-06: Work out PCB design using the relevant approach.**

<b>6</b>	<b>PRINTED CIRCUIT BOARD DESIGN</b> 6.1 Types of printed circuit boards. 6.2 Preparation for designing of PCB. 6.3 Recent trends in designing of PCB.	<b>04</b>	<b>12</b>
		<b>24</b>	<b>40</b>

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

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

Section / Topic no.	Name of topic	Distribution of marks Cognitive based (level wise)			Course outcome	Total marks
		Remember	Understanding	Application		
I/1	Semi-Conductor Diode	4	8	2	EEF303-01	14
I/2	D.C. Power Supply	2	4	8	EEF303-02	14
I/3	Bipolar Junction Transistor	4	4	4	EEF303-03	12
II/4	Logic Gates	4	4	6	EEF303-04	14
II/5	Photo Devices	4	4	6	EEF303-05	14
II/6	Printed circuit board design.	4	4	4	EEF303-06	12
		22	28	30		80

**D] Laboratory experiences and related skills developed.**

Sr. no	Laboratory experience	Skills developed	Course outcome
1	Static characteristics of semi conductor diode	1) Students will be able to understand working of diode. 2) Students will be able to plot forward & Reverse characteristic 3) Students will be able to determine Forward Bias Voltage & Reverse Breakdown Voltage. 4) Connections of components	EEF 303-01
2	Determination of static characteristics of Zener diode	1) Students will be able to understand the working of Zener diode. 2) Students will be able to understand applications of Zener Diode. 3) Connections of components	EEF 303-01
3	Zener shunt voltage regulator	1) Students will be able to understand the working of Zener diode. 2) Students will be able to understand working of voltage regulator Zener Diode. 3) Connections of components.	EEF 303-01
4	Experiments on Power supply circuits Half Wave Rectifier Full Wave Rectifier Regulator circuits	1) Students will be able to understand working of half wave, full wave rectifiers 2) Observe half wave, full wave on CRO 3) Working of regulator. 4) Connections of components.	EEF 303-02

Sr. no	Laboratory experience	Skills developed	Course outcome
5	Static characteristics of transistor in CE configuration.	1) Students will be able to understand transistor CE Configuration. 2) Students will be able to understand How transistor works as an Amplifier 3) Students will be able to understand Why CE configuration is suitable for an amplifier	EEF 303-03
6	Input, Output characteristics of common base configuration.	1) Write input & output voltage & current 2) Make proper connection as per circuit diagram 3) Draw the input & output characteristics	EEF 303-03
7	Logic gate and truth table verification.	1] Configurations of logic gates 2] Determination and verification of Truth table. 3] Connections of components.	EEF 303-04
8	Experiment on Photo Devices to observe working and finding characteristics.	1) Students will be able to understand principle of operation of any one Photo Devices 2) Students will be able to understand any one Photo Device Characteristics. 3) Students will be able to understand specifications of Photo Device.	EEF 303-05
9	Experiment on PCB designing process.	1) Students will be able to understand the process of PCB manufacturing and testing. 2) Students will be able to understand the process of soldering components on PCB and Testing. 3) Students will be able to understand the process testing of designed circuit.	EEF 303-06
Student should make layout, construct, test and produce satisfactory results for any one small electronic project based on the above syllabus & submit a report on the work done.			

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

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	2.5
2	Preparedness for practical	5
3	Correct figures / diagrams	5
4	Observation tables	5
5	Result table / calculations / graphs	5
6	Safety / use of proper tools	2.5
		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) Chalk-board.
- 2) Demonstrative kits,
- 3) Demonstrative charts.

**F] Reference Books:** 1.. Electronic devices & Circuits: Allen Mottershed ,  
2. Principles of Electronics: V. K. Mehta, 3. Electronic devices & Circuits: Millman & Halkies.

**Course ID :****Course Name : Electrical Measurements& Instrumentation****Course Code : EEF304****Course Abbreviation: FEMI****Pre-requisites : EEF102****Teaching Scheme and Evaluation Scheme****Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme:**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (Internal)	
<b>Details of Evaluation</b>	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-II	
<b>Marks</b>	<b>20</b>	<b>--</b>	<b>80</b>	<b>25</b>	<b>25 I</b>	<b>150</b>

**Rationale:**

The course deals with the principle, construction and application of various electrical measuring instruments used in circuits for measurement of various Electrical quantities in the area of industry as well as in electrical power systems. The topics included are meant to prepare the technicians to carry out these responsibilities in day to day work.

This course also deals with various methods for measurement of non electrical quantities in various process industries, power projects, substations etc. for measurement of pressure, temperature, displacement etc.

**Course Competency:** Carryout electrical and instrumentation based measurements of different parameters.

**Cognitive:** Understanding principles of measurements related to engineering fields.

**Psychomotor:** Use relevant measuring techniques/ instruments for different electrical and some non electrical quantities.

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

**Course Outcomes :**

EEF304-1. Use analog electrical measuring instruments.

EEF304-2. Carryout measurement of resistance, inductance and capacitance using relevant Instruments and methods.

EEF304-3. Carry out measurement of Power and Energy using relevant instrument and methods.

EEF304-4. Extend the range of instruments, measure p.f., frequency, MD, AD and use phase sequence indicator as well as Synchroscope.

EEF304-5. Use different transducer based instruments for various measurements.

EEF304-6. Use electronic instruments for electrical measurements and display.

**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	PSO1 Electrical Equipment	PSO2 Electrical Power systems
<b>Competency</b> Carry out instrumentation and electrical measurements.	3	3	3	3	2	—	—	2	2	3	3	3
EEF304-1. Use analog electrical measuring instruments.	3	3	3	2	2	—	—	1	1	2	2	2
EEF304-2. Carryout measurement of resistance, inductance and capacitance using relevant Instruments and methods.	3	3	3	3	2	—	—	1	1	2	2	2
EEF304-3. Carry out measurement of Power and Energy using relevant Instrument and methods.	2	3	3	1	1	—	—	1	1	1	3	3
EEF304-4. Extend the range of instruments, measure p.f., frequency, MD, AD and use phase sequence indicator as well as Synchroscope.	3	3	2	2	3	—	—	1	1	2	2	3
EEF304-5. Use different transducer based instruments for various measurements.	2	2	1	1	2	—	—	1	1	1	2	2
EEF304-6. Use electronic instruments for electrical measurements and display.	3	2	2	1	1	—	—	2	1	2	2	2

**A] CONTENTS:****Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>EEF 304-1: Use analog electrical measuring instruments.</i>			
<b>1.</b>	<b>ELECTRICAL MEASURING INSTRUMENTS</b>	<b>04</b>	<b>10</b>
1.1	Components of electrical measuring instruments		
1.2	Classification.		
1.3	Permanent magnet moving coil instrument.		
1.4	Moving iron instrument.		
1.5	Dynamometer type instrument.		
1.6	Working of digital voltmeters and ammeters with their advantages.		

*EEF 304-2 : Carryout measurement of resistance, inductance and capacitance using relevant Instruments and methods.*

<b>2.</b>	<b>MEASUREMENT OF ELECTRICAL CIRCUIT PARAMETERS</b> 2.1 Accuracy & precision, significant figures and types of errors. 2.2 Standards – Voltage, Current, Frequency, & Resistance. 2.3 Statistical errors. 2.4 Measurement of resistances voltmeter-ammeter method. 2.5 Measurement of resistance by Wheatstone- & Kelvin Double bridge method. 2.6 Measurement of Inductance by Anderson & Maxwell bridge circuit. 2.7 Measurement of capacitance by Schering bridge. 2.8 Megger & its application. 2.9 Measurement of Inductance, capacitance and resistance using digital LCR meter	<b>10</b>	<b>14</b>
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*EEF 304-3: Carry out measurement of Power and Energy using relevant Instrument and methods.*

<b>3.</b>	<b>MEASUREMENT OF POWER AND ENERGY</b> 3.1 Introduction, Types & Classification of wattmeters. 3.2 Measurement of active and reactive power three phase circuit for balanced and unbalanced load by using two watt meter, Calculation and Effect of p.f. on wattmeter readings. (Simple Numericals) 3.3 Measurement of active & reactive power in three phase balanced load by using one wattmeter method. 3.4 Digital Energy meters[ Single and Three phase]. 3.5 Measurement of power and energy using C.T. & P.T. 3.6 Calibration of energy meter. 3.7 Tri-vector meter. 3.8 Prepaid Energy meter.	<b>10</b>	<b>16</b>
	<b>Total -</b>	<b>24</b>	<b>40</b>

## Section II

<b>Sr. no.</b>	<b>Topics Subtopics</b>	<b>Teaching (Hours)</b>	<b>Theory evaluation Marks</b>
<i>EEF 304-4: Extend the range of instruments, measure p.f., frequency, MD, AD; use phase sequence indicator and synchroscope.</i>			
<b>4.</b>	<b>EXTENSION OF INSTRUMENT RANGE.AND MEASUREMENT OF OTHER QUANTITIES.</b> 4.1 Extension of Ammeter and voltmeter range 4.2 Extension of wattmeter & energy meter range	<b>06</b>	<b>10</b>

	4.3 Power factor meters (single phase & three phase) 4.4 Frequency meter Electrical resonance and Weston type 4.5 Rotating type phase sequence indicator 4.6 Demand indicators: Maximum and Average demands. 4.7 Synchroscope; Working and use.		
<i>EEF 304-5: Use different transducer based instruments for various measurements.</i>			
5.	<b>TRANSDUCERS</b> 5.1 Mechanical, electrical, resistive, inductive, capacitive, piezoelectric, photoelectric. 5.2 Transducer selection factors. 5.3 Measurement of temperature. 5.3.1 Temperature measuring devices. 5.3.2 Bimetallic thermometers. 5.3.3 Resistance temperature detector. 5.3.4 Thermistors & Thermocouples. 5.3.5 Applications temperature transducers. 5.4 Measurement of Displacement. 5.4.1 L V D T – construction, Operation. 5.4.2 Null voltage & its reduction 5.4.3 LVDT specifications, advantages & applications. 5.5 Strain Gauges- Types of strain gauges - unbounded, bounded, Semiconductor, Bourden tube, Bellows, Diaphragm. 5.6 Effect of temperatures on strain gauges, Strain Gauge circuitry. 5.7 Application of strain gauges based on load and pressure.	12	20
<i>EEF304-6: Use electronic instruments for electrical measurements and display.</i>			
6.	<b>SIGNAL CONDITIONING, DISPLAY &amp; RECORDER INSTRUMENTS</b> 6.1 Block diagram of AC and DC signal conditioning systems in instrumentation. 6.2 Digital Multimeter. 6.3 Function Generators 6.4 Strip chart recorder, X-Y recorder and plotter. 6.5 Basic Oscilloscope [CRO], Controls, Their types. 6.6 Lissajous figures, & Applications of CRO	06	10
		24	40

Specification table for setting question paper for semester end theory examination

Topic no./ Section	Name of topic	Distribution of marks (Cognitive based) (level wise)			Course outcomes	Total marks
		Remember	Understanding	Application		
1/I	Electrical Measuring Instruments	2	4	4	EEF 304-01	10
2/I	Measurement of electric circuit parameters	2	4	8	EEF 304-02	14

3/I	Measurement of power & energy	4	4	8	EEF 304-03	16
4 /II	Extension of instrument range. and measurement of other quantities.	2	4	4	EEF 304-04	10
5/II	Transducers	4	8	8	EEF 304-05	20
6/II	Signal conditioning, display & recorder instruments.	2	4	4	EEF 304-06	10

**B] Laboratory experiences . [ Minimum experiments to be performed eight]**

Sr. no	Laboratory experience	Skills to be developed	Course outcome
1	Measurement of power in single phase Inductive/Capacitive circuit by using voltmeter, ammeter and a power factor meter.	1] Circuit connections, 2] Measurements, 3]Circuit functions.	EEF 304-01
2	Measurement of insulation resistance by Megger	Use of Megger.	EEF 304-01
3	Measurement of low resistance by Kelvin Double-bridge method.	1]Working, 2]How to use, 3]functions of bridge	EEF 304-02
4	Measurement of medium resistance by Wheatstone-bridge method.	1]Working, How to use, 2] functions of bridge.	EEF 304-02
5	Measurement of power in three phases balanced / unbalanced circuit by two-wattmeter method.	1] Circuit connections, 2] Working of two watt meter.	EEF 304-03
6	Measurement of reactive power in three phases balanced circuit by single-wattmeter method.	1]Circuit connections, 2] Balanced and unbalanced difference.	EEF 304-03
7	Measure frequency of AC supply using Weston frequency meter and Observe phase sequence using rotating phase sequence indicator.	1]Circuit connections, 2] Working of frequency meter.	EEF 304-03
8	Use of CT. & PT. for Extension of range of Ammeter, voltmeter and wattmeter.	1] CT PT connections, 2] use in measurement.	EEF 304-04
9	Measure Temperature using Transducers.	1]Circuit connections, 2]Working of Transducer	EEF 304-05
10	Measurement of displacement using LVDT .	1]Circuit connections, 2]Working of Transducer	EEF 304-05
11	Measure voltage and current using Cathode Ray Oscilloscope.	Use of Oscilloscope.	EEF 304-06

**(C ) Observe measuring instrument on panel during industrial visit.**

**Assessment Criteria for Term work :****i) Continuous Assessment of Practical Assignments :**

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

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

**ii) Progressive Skill Test :**

One mid-term Progressive Skill Test of 25 marks shall be conducted as per criteria given in Laboratory Manual for Electrical Measurements & Instrumentation.

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

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices.

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations.
3. Demonstrative kits.
4. Demonstrative charts.

**Ref. Books:**

1. Electrical Measuring Instruments - by D.B. Dhar.
2. Electrical Technology vol. I - by B.L. Theraja.
3. Measuring Instruments - by Satyanarayan.
4. Electrical & Electronics Measurements & Instrumentation - A. K. Sawhney.
5. Electronic Measurements & Instrumentation - Cooper and Helfrick.

**Website for references :**

- 1) [www.electrical4u.com](http://www.electrical4u.com)
- 2) [www.electricalengineeringschools.org](http://www.electricalengineeringschools.org)
- 3) [www.google.com](http://www.google.com)
- 4) [www.wikipedia.com](http://www.wikipedia.com)

**Course ID:****Course Name : Electrical Materials, Wiring and Illumination****Course Code : EEF305****Course Abbreviation : FMWI****Pre-requisite Course(s) : Nil****Teaching and evaluation scheme:****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	04
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral/practical 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)	Pro-forma II	Oral Examination (Internal) Proforma VI	
Marks	20	--	80	25	25I	150

**Rationale :**

The Electrical engineer is required to work as supervisor in small scale industries and construction industries. He should be well equipped with the skills of wiring related to the electrical engineering field. He should also be able to select proper/relevant electrical materials/accessories in different situations while carrying out original works or maintenance works. Hence he should be well conversant with the specifications of material as per the applications. Invariably he has also to design illumination schemes for general occupancies. This course will arm the students to face such situations successfully.

**Competency:**

The aim of this course is to help the student to attain the following competency through various teaching learning experiences: by following safety practices troubleshoot electrical wiring and prepare general illumination schemes as well.

**Cognitive:** i) Identify the tools and accessories/materials of electrical wiring.

ii) Identify the conducting, insulating and magnetic materials used in electrical engineering.

iii) Identify the relevant illumination scheme components required for different occupancies.

**Psychomotor :** i) Use the relevant tools and accessories in electrical wiring works.

ii) Prepare drawings of electrical wiring and illumination works.

**Affective :** Attitude of i) safety ii) accuracy iii) aestheticism in works.

**Course outcomes:**

EEF305-1. Use proper conducting materials for applications in electrical engineering fields.

EEF305-2. Recommend proper magnetic/electromagnetic parts for applications in the electrical engineering fields.

EEF305-3. Select relevant insulating materials.

EEF305-4. Use of relevant wiring accessories, tools and components.

EEF305-5. Design illumination scheme and carry out required electrification works.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/psd) matrix**

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

<b>Semester III</b> <b>Competency and COs</b>	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 system
<b>Competency:</b> Troubleshoot electrical wiring and use properly identified tools, accessories, materials following safety practices	3	1	3	1	1	1	1	2	1	2	3	3
EEF305-1. Use proper conducting materials for applications in electrical engineering fields.	3	2	3	1	1	1	1	2	1	2	3	3
EEF305-2. Recommend proper magnetic /electromagnetic parts for applications in the electrical engineering fields.	3	2	3	2	1	1	1	2	1	3	3	3
EEF305-3. Select relevant insulating materials.	3	2	3	2	1	1	1	2	1	2	3	3
EEF305-4. Use relevant wiring accessories, tools and components.	3	2	3	1	1	1	1	2	1	2	3	3
EEF305-5. Design illumination scheme and carry out required electrification works.	3	2	3	1	1	—	1	2	1	2	3	3

**Contents :****A) Theory : Section - I**

<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>	<b>Theory Evaluation (Marks)</b>
<i>CO: EEF305-1. Use proper conducting materials for applications in electrical engineering fields.</i>			
<b>1</b>	<b>1. Conducting Material</b> 1.1 Introduction: - Classification of Electrical engineering materials, Resistivity and temperature coefficient of resistance for metals and alloys. 1.2 Electrical conducting materials: Characteristics of good conducting materials, commonly used conducting materials, properties and uses of copper, aluminum, tungsten, brass, bronze, mercury, silver, lead, nickel and tin. 1.3 Thermal, mechanical and electrical properties of above materials. 1.4 Comparison of copper and aluminum as conductors for power transmission lines. 1.5 Conducting materials used for electrical machine windings. 1.6 Applications of conducting materials.	<b>10</b>	<b>16</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CO: EEF305-2. Recommend proper magnetic/electromagnetic parts for applications in the electrical engineering fields.</i>			
<b>2</b>	<b>2. Magnetic Material</b> 2.1 Introduction to magnetic materials. 2.2 Magnetization Characteristics 2.2.1 Ferromagnetic materials. 2.2.2 Magnetization curve. 2.2.3 Hysteresis, hysteresis loop and hysteresis loss. 2.2.4 Magnetostriction 2.3 Paramagnetic, diamagnetic and ferromagnetic materials, C. R. G. O. silicon steel, H. R. G. O. silicon steel 2.4 Typical hysteresis loops for different ferromagnetic materials (hard steel, wrought iron and alloyed steel) 2.5 Loss of magnetism. 2.6 Impurities in ferromagnetic materials 2.7 Properties of soft magnetic and hard magnetic material 2.8 Applications of magnetic materials. 2.9 Introduction to permanent magnet.	<b>7</b>	<b>12</b>
<i>CO: EEF305-3. Select relevant insulating materials.</i>			
<b>3.</b>	<b>3. Insulating Materials</b> 3.1 Introduction- Important electrical properties of insulators. 3.2 Classification of Insulating material-Typical examples of gaseous, liquid and solid insulators. 3.2 Breakdown in insulating materials (gaseous, liquid & solid state). 3.3 Electrical properties: Insulation resistance, volume resistance and surface resistance. Effect of various factors on insulation resistance. 3.4 Mechanical properties: viscosity, porosity and solubility. 3.5 Thermal properties- Thermal stability, melting point, flash point, volatility, thermal conductivity, thermal expansion and heat resistance. 3.6 Chemical properties. 3.7 Thermal classifications of insulators. 3.8 Some important insulating properties of following material: Mica, porcelain, marble, cotton, silk, Bakelite, mineral oil or transformer oil and asbestos. 3.9 Applications of above materials.	<b>7</b>	<b>12</b>

**SECTION –II**



Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CO: EEF305-4. Use relevant of wiring accessories, tools and components.</i>			
<b>4</b>	<b>Electrical Wiring:</b> 4.1 Tools and safety practices in wiring: Tester, screw driver, combination pliers, long nose pliers, stripper, wire cutter, test lamp, mallet, hacksaw frame with blade, drill machine, drill bit, SWG, crimping machine. Safety practices to be followed in wiring installation work. 4.2 Accessories: Switches, plugs, switch boards, ceiling roses, fans, fan regulators, fuse, indicator bulb, holders, lugs, DB with MCB & ELCB, ICDP and ICTP. 4.3 Types of wires and specifications: 1. V.I.R Wires ( Vulcanized India rubber) 2. P.V.C Wires (Polyvinylchloride) 3. F.R.Wires (Fire retardant) 4.4 Types of wiring systems with sizes: Metal Conduit, P.V.C Pipe, P.V.C Casing capping, Concealed systems of wiring. 4.5 Types of wiring circuits: - Control of one lamp using one single pole switch. - Control of one lamp using two single pole switches. - Staircase wiring for one and two staircases. - Godown wiring.	<b>14</b>	<b>24</b>
<i>CO: EEF305-5. Design illumination schemes and carry out electrification works.</i>			
<b>5</b>	<b>Illumination</b> 5.1 Terminology in Illumination 5.2 Laws of Illumination 5.3 Practical lighting schemes 5.3.1 Different types lighting arrangements 5.3.2 Lighting system consideration for different occupancies. <b>Lighting Schemes :-</b> 5.4 Design Consideration of good lighting schemes. 5.5 Intensity of illumination 5.5.1 Selection of luminaries. 5.5.2 Size of room. 5.5.3 Mounting height and spacing fittings. 5.5.4 Conditions of use. 5.5.5 Calculations of illumination. 5.5.6 Design of illumination scheme. 5.5.7 Illumination levels required for various location.	<b>10</b>	<b>16</b>

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

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	Course outcome
		Knowledge	Comprehension	Application		
I/ 1	Conducting material	02	04	10	16	EEF305-01
I/2	Magnetic material	02	04	06	12	EEF305-02

I/3	Insulating materials	02	04	06	12	EEF305-03
II/4	Electrical wiring	04	08	12	24	EEF305-04
II/5	Illumination	04	04	08	16	EEF305-05

**Laboratory experiences and related skills developed.**

Sr No.	Name of Practical	Skills to be developed	Course outcome
01.	To Know your electrical engineering laboratory: Draw layout of electrical engineering laboratory. Prepare Charts of electrical safety and study the operation of fire extinguishing equipments. Study and use of electrical tools such as pliers, screw driver, insulation cutter, tester, etc.	1] To understand and use of electrical tools. 2] Safety precautions in lab. 3] Use of Fire extinguisher. 4] In detail knowing of lab.	EEF305-01
02.	To identify the conducting material from electrical machine	1] Identification of conducting material used for machines.	EEF305-01
03.	To identify the magnetic material from electrical machine	1] Identification and use of magnetic material used for machines. 2] Use them when required.	EEF305-02
04.	To identify the insulating material from electrical machine	1] Identification of magnetic material used for machines. 2] Use them when required.	EEF305-03
05.	To study & draw Staircase & Godown wiring	1] To acknowledge Staircase & Godown wiring	EEF305-04
06.	To study of fluorescent tube & its connection	1] To acknowledge tube set wiring and parts 2] Understand Its working	EEF305-04
07.	To observe & Draw various tools & electrical accessories	1] Identification of electrical accessory used for wiring. 2] Use them when required	EEF305-05
08.	To prepare illumination scheme for 1BHK flat with lamp disposition diagram	1] Determination of lamps 2] Disposition of lamps.	EEF305-05
09	To prepare illumination scheme for workshop with lamp disposition diagram	1] Determination of lamps 2] Disposition of lamps.	EEF305-05

**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.

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

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

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 50 marks shall be conducted as per criteria given in *Laboratory Manual for Electrical Power Generation*

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

**Text Books:-**

Sr. no.	Name of Book	Author	Publisher
1	Electrical Engg. Materials	C.S.Indulkar;A.K.Theraja	S.Chand &Co.
2	Electrical Design Estimating &Costing	K.B.Raina;S.K.Bhattachrya	New Age Delhi
3	Electrical Estimating &Costing	Surjit Singh	Dhanapat Rai &Co.
4	Electrical Estimating &Costing	N Algappan ;S. Ekambaram	Tata Magraw Hill new delhi

**Web sites:-** 1. [www.electrical4u.com](http://www.electrical4u.com)2. [www.electricalengineeringschool.com](http://www.electricalengineeringschool.com)3. [www.google.com](http://www.google.com)4. [www.wikipedia.com](http://www.wikipedia.com)

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**Course ID :****Course Name : Electrical power generation****Course Code : EEf306.****Course Abbreviation : FEPG.****Pre-requisite Course(s): EEf102.****Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	04
Practical/ Tutorial	01	

**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	i. 25 marks for each practical ii. One PST of 50 marks	Term End Theory Exam (03 hours)	As per Proforma VI	Proforma V	
Marks	20	--	80	25	25I	150

**Rationale :**

This course deals in detail about generation of electric power using Thermal (Coal), Hydro, Nuclear fuels. These types of power plants need highly skilled technicians who are capable of operating various control equipment to supply uninterrupted power. This course attempts to develop the basic skills required to take appropriate actions to maintain the various generating and auxiliary equipment of power plants

**Competency : Assist in operation & maintenance of different types of electric power generating plants.**

**Cognitive :** Understand the operation of different types of electric power generating plants.

**Psychomotor :** Operate the different controls of different types of electric power generating plants.

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

**Course outcomes :**

**EEF 306 -1** Suggest use of electrical energy in safe & environment friendly manner.

**EEF306 -2** Select the power generation technique based on economy

**EEF306 -3** Work as team member in erection & operation of different power plants

**EEF306 -4** Maintain wind and solar power plants.

**EEF306 -5** Operate Bio-mass, bio-gas & Ocean power plant.

**EEF306 -6** Operate Geothermal, MHD power plant.

**Competency, course outcomes and programme outcomes ( cp-co-po ) matrix**

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

Competency and COs	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 Electrical equipment	PSO2 Electrical power system
Assist in operation & maintenance of different types of electric power generating plants.	3	3	3	2	2	1	1	2	3	2	3	3
<b>EEF 306 -1</b> Suggest use of electrical energy in safe & environment friendly manner .	3	3	2	3	3	2	1	3	3	2	2	2
<b>EEF306 -2</b> Select the power generation technique based on economy.	3	3	3	3	2	1	1	3	3	2	2	2
<b>EEF306 -3</b> Work as team member in erection & operation of different power plants.	2	3	3	3	2	1	1	3	3	2	3	3
<b>EEF306 -4</b> Maintain wind and solar power plants.	3	3	2	2	3	1	1	3	3	2	3	3
<b>EEF306 -5</b> Operate Bio-mass , bio-Gas & Ocean power plant.	3	3	2	1	3	2	1	3	3	2	3	2
<b>EEF306 -6 7</b> Operate Geothermal ,MHD power plant.	3	3	2	1	3	1	—	2	3	3	3	3

**Content :****A] Theory :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEF306-1 Suggest use of electrical energy in safe & environment friendly manner.			
<b>1</b>	<b>Basics of power generation</b> 1.1. Importance of electrical power in day-to-day life. 1.2 Various sources of energy. 1.3 Environmental issues of electrical power generation. 1.4 Comparison of sources of power generation.	<b>03</b>	<b>06</b>
EEF306 -2 Select the power generation technique based on economy.			
<b>2.</b>	<b>Economics Aspects.</b> 2.1 Related terms: Connected Load, firm power, cold reserve, hot reserve, spinning reserve. Base load and peak load plants, load curve, load duration curve, integrated duration curve. 2.2 Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor. 2.3 Choice of size and number of generator units, combined operation of power station. 2.4 Grid systems: State grid, national grid, brownout and black out. Impact and reasons of sample blackouts at	<b>06</b>	<b>10</b>

[illegible]

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	<b>4.2 Wind Power Plant</b> 3.1 Energy in the wind: Power contained in wind, aerodynamic forces (lift and drag), maximum power extracted from wind. 3.2 Site Selection: Wind speed measurement and estimation of energy produced. 3.3 Basic Components: Block diagram, functions of each part. 3.4 Classification of wind turbines: horizontal and vertical. 3.5 Wind Turbine Generators: construction and working of basic induction generator and other types of generators, and block diagram of power electronic systems.	<b>05</b>	<b>(08)</b>
EEF306 -5 :Operate Bio-mass , bio-gas & Ocean power plant			
<b>05</b>	<b>5.1 Bio-gas energy&amp; Bio-mass Energy</b> 5.1.1 Composition of Bio-gas & its calorific value. 5.1.2 Types Of Bio Gas plants, KVIC Digester, Fixed dome digester, Dinbhandu, Pragati Biogas plant. 5.1.3 Bio-mass based power generation plants & their capacities. <b>5.2 Energy from the oceans</b> 5.2.1 Ocean energy : Ocean thermal Electric conversion :- open cycle turbine system, closed cycle system. 5.2.2 Tidal Power: Basic principle, operation methods of tidal power plant, utilisation of tidal energy, site requirements, advantages & limitations of tidal power generation.	<b>05</b>          <b>05</b>	<b>14</b>          <b>(06)</b>
EEF306 -6: Operate Geothermal, MHD power plant.			
<b>06</b>	<b>Energy from other Sources</b> 6.1 Geothermal Energy. 6.1.1 Geothermal energy sources, working principle. 6.1.2 Geothermal energy power plant. 6.1.3 Advantages, limitations & applications geothermal. 6.2 Fuel cell. 6.2.1 Construction & working. 6.2.2 Advantages, limitations & applications. 6.3 Magneto-Hydro Dynamic (MHD) 6.3.1 Power generation: - working principle. 6.3.2 MHD System. 6.3.3 Advantages and applications.	<b>06</b>	<b>12</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

**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	Basics of power generation	04	02	00	EEF306-1	06
2	Economics aspects	02	04	04	EEF306-2	10
3	Generating stations	10	04	10	EEF306-3	24
4	Solar (electrical) & wind power plant	04	04	06	EEF306-4	14
5	Bio-gas, Bio-mass & oceans energy.	04	04	06	EEF306-5	14
6	Energy from other Sources.	02	04	06	EEF306-6	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.

**A] 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 for Electrical Power Generation developed* by the Institute in practical sessions of batches of about 22 students:

**Assignments: Note-Use half imperial drawing sheets**

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
01	Draw labeled layout of Coal based thermal power plant.	To know the various equipments in thermal power plant.	EEF306-3
02	Draw labeled layout of Hydroelectric power plant	To know the various equipments in hydro power plant	EEF306-3
03	Draw labeled layout of Nuclear power plant	To know the various equipments in Nuclear power plant	EEF306-3
04	Calculate the cost per unit generated for a Coal based thermal power plant	Able to determine the cost per unit for generation	EEF306-3
05	Calculate the cost per unit generated for a Hydroelectric power plant	Able to determine the cost per unit for generation	EEF306-3
06	Calculate the cost per unit generated for a Nuclear power plant	Able to determine the cost per unit for generation	EEF306-3
07	Suggest suitable components of solar water heating scheme for given customer requirement	To know the various components for solar water heater	EEF306-4
08	Estimate amount of electricity produced using pre-collected wind data at a particular location.	Able to determine the economics of wind power generation	EEF306-4

**(C)Industrial Visits to all above Electrical power generation plant.****Assessment Criteria for Term work:****i) Continuous Assessment of Practical Assignments:**



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

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

**ii) Progressive Skill Test:**

One mid-term *Progressive Skill Test* of 50 marks shall be conducted as per criteria given in *Laboratory Manual for Electrical Power Generation*.

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

**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.

**Ref. Books / Journals / IS Codes**

Sr. No.	Title	Author	Publisher
01.	Generation of electrical energy	Dr. Gupta BR	S.Chand & Co. New Delhi, 1983, ISBN: 9788121901024
02.	A course in electrical power	Gupta JB	S. K Kataria and sons, 2014, ISBN: 9789350143742
03.	A course in electrical power.	Soni, Gupta, Bhatnagar	Dhanpatrai and sons ISBN: 9789350143742
04.	Principles of power system	Mehta VK and Rohit mehta	S.Chand & Co. New Delhi, 1982, ISBN: 9788121924962
05	Power plant engineering	Nag P K	Tata McGraw Hill, New Delhi ISBN: 9788174093097

**SOFTWARE/LEARNING WEBSITES**

www.ntpc.co.in, www.nhpcindia.com,  
 www.nptel.ac.in, www.mnre.org.in  
[www.powergridindia.com](http://www.powergridindia.com),  
 www.howstuffworks.com ,  
 www.electrical4u.com  
 www.meda.com

**Course ID :****Course Name : D.C. Machines and Transformer.****Course Code : EEf307****Course Abbreviation : FDMT****Pre-requisites : EEf102****Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i.50 marks for continuous assessment ii.One PST of 50 marks	Term End Theory Exam (03 hours)	-	As per Performa	
Marks	20	-	80	25	50 E	175

**Rationale:**

The knowledge of DC machines including their characteristics is necessary for students of Electrical Engineering. The subject deals with the concepts, characteristics & applications of DC Generators, Motors and Transformers.

A diploma holder has to work in various fields such as manufacturing industries, State Electricity boards, Power Generation Stations, etc. His work involves operation control and maintenance of electrical machines. He should therefore know the working principle, constructional features, and performance of DC machines.

Transformer is one of the most important devices of electrical power system. It has imparted more flexibility to AC system than DC system, due to which the AC system is widely preferred over DC system in most of the applications. Since technicians are expected to work with various electrical / electronic systems involving transformer, it is highly essential to provide them necessary knowledge about construction, operation & testing of transformer with mathematical background.

This course aims at strategic development of students so that they can understand, operate, use & test the d.c machines & transformer as per the requirement.

**Course Competency** : Use DC machines and transformers.

**Course Outcomes**

- EEE307-1. Identify the different parts along with materials in the d.c. machines
- EEE307-2. Determine practically the performance characteristics of d.c. machines
- EEE307-3. Identify the different parts along with materials of single phase transformer
- EEE307-4. Determine the performance parameter of single phase transformer
- EEE307-5. Operate single phase transforms in parallel carrying out load sharing calculations
- EEE307-6. Use three phase transformer and operate it in parallel.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Use DC machines and transformers.	2	3	2	2	2	—	2	2	2	3	3	3
<b>EEF307-1.</b> Identify the different parts along with materials of the d.c. machines	2	3	3	3	2	—	2	2	2	3	3	3
<b>EEF307-2.</b> Determine practically the performance characteristics of d.c. machines	2	3	3	3	1	—	1	3	2	2	3	3
<b>EEF307-3.</b> Identify the different parts along with materials of single phase transformer	2	3	2	2	1	—	1	3	2	3	3	3
<b>EEF307-4.</b> Determine the performance parameter of single phase transformer	2	3	2	2	2	—	2	2	1	3	3	3
<b>EEF307-5.</b> Operate single phase transforms in parallel carrying out load sharing calculations	2	3	3	2	2	—	2	2	2	3	3	3
<b>EEF307-6.</b> Use three phase transformer and operate it in parallel	2	1	3	2	2	—	2	2	2	3	3	3

**Contents:****A) Theory****Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
CO: EEF307-1: Identify the different parts along with materials in the d.c. machines			
1	D. C. Machines 1.1 Constructional Features of D C Generator 1.2 Principle of Operation of D C Generator. 1.3 Classification of D C Generator 1.4 EMF Equation of Generator 1.5 Numerical on 1.4 1.6 Load characteristic (Terminal voltage & load current) 1.7 Applications of D C Generator.	8	12
CO: EEF307-2: Determine practically the performance characteristics of d.c. machines			

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluati on Marks
2	D. C. Motor 2.1 Principles of Operation of D C Motor 2.2 Classification of D C Motor 2.3 Concept of Back e.m.f. 2.4 Voltage equation 2.5 Torque equation of D C Motor 2.6 Load characteristics of D.C. Shunt and D.C. Series motors (Torque & speed, Torque & Current ) 2..7 Speed control of D C Motor (Series & Shunt by Flux Rheostatic methods) 2.8 Starting of D.C. Motor & 3-Point Starter. 2.9 Applications of DC motors 2.10 Losses & Efficiency in D C machines 2.11 Numericals based on 2.7&2.10	8	14
3) CO: Identify the different parts along with materials of single phase transformer			
3	Single Phase Transformer: 3.1 Introduction 3.2 Principle of operation 3.3 Types of Transformers 3.4 Construction of transformer 3.4.1 Magnetic core 3.4.2 cooling arrangement 3.4.3 Use of Conservators and Breathers 3.5 E.M.F. equation of single phase transformer 3.6 Transformation ratio, 3.7 Why transformer rating is in KVA 3.8 Concept of ideal transformer 3.9 Transformer on no load – Phasor diagram 3.10 Transformer on load – Phasor diagram 3.11 Numericals	8	14

**Section –II**

Sr. no.	Topics/Subtopics	Teaching (Hours)	Theory evaluation Marks
<b>CO: EEF307-4: Determine the performance parameters of single phase transformers.</b>			
4	Performance & Operation of Transformer. 4.1 Equivalent circuit 4.2 Transformer Tests 4.2.1 Open – circuit or No load Test 4.2.2 Short – circuit or Impedance Test 4.3 Efficiency & Regulation of transformer 4.4 Condition for maximum efficiency 4.4 Determination of efficiency & regulation of transformer by direct loading method 4.5 All day efficiency of a transformer 4.6 Numerical based on above 4.7 Single phase auto transformer – principle , savings affected, advantages & disadvantages.	14	20
<b>CO: EEF307-5: Operate single phase transforms in parallel carrying out load sharing calculations</b>			
5	Parallel operation of transformers 5.1 Need of parallel operation 5.2 Conditions to be satisfied for parallel operation. 5.3 Load- sharing calculations 5.4 Numerical based on above	06	12
<b>CO: EEF307-6: Use three phase transformer and operate it in parallel</b>			
6	Three phase Transformer 6.1 Construction-Types –power and distribution transformers. 6.2 Connections. 6.3 Voltage & current ratio 6.4 Conditions to be satisfied for parallel operation of 3- $\phi$ Transformers. 6.5 Application of three phase transformers.	4	8

Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	D. C. Machines	4	4	4	12	EEF307-1
I / 2	D. C. Motor	4	4	6	14	EEF307-2
I / 3	Single phase transformer:	4	4	6	14	EEF307-3
II /4	Performance and operation of single phase transformers	6	6	8	20	EEF307-4
II /5	Parallel operation of single phase transformer	4	4	4	12	EEF307-5
II / 6	Three phase transformer	4	-	4	8	EEF307-6

**B: Practical works:**

Sr. no	Laboratory experiences	CO
1	Dissemble/Assemble DC machines identifying the parts..	EEF307-1

Sr. no	Laboratory experiences	CO
2	Starters for DC shunt motors.	EEF307-2
3	Speed-Torque characteristics of a DC shunt motor.	EEF307-2
4	Speed control of DC shunt motor using Flux Control & Armature Voltage Control method	EEF307-2
5	Load characteristic of D.C. series motor.	EEF307-2
6	Determine the voltage ratio and current ratio of given 1- $\phi$ transformer.	EEF307-3
7	Determine the efficiency & regulation of given transformer by Direct loading.	EEF307-4
8	Perform Open circuit (OC) test and Short circuit (SC) test on given 1- $\phi$ transformer	EEF307-4
9	Perform parallel operation of two 1- $\phi$ transformers.	EEF307-5
10	Study the constructional details of distribution & power transformers. (based on visit to transformer manufacturing industry)	EEF307-6

**(C)Industrial Visits to transformer repair workshop or manufacturing plant.****Assessment Criteria for Term work :****i) Continuous Assessment of Practical Assignments :**

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

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

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 50 marks

**Instructional Methods :**

Lectures cum Demonstrations, Classroom practices.

**Teaching and Learning resources :**

Chalk board , LCD presentations, Demonstrative kits, Demonstrative charts.

**Reference Books:**

1. Electrical Technology (by Edward Hughes).
2. Electrical Technology (by H. Cotton).
3. Basic Electrical Engineering (by V. N. Mittal)
4. Electrical technology (vol. II AC & DC Machines) (by B. L. Theraja).
5. Fundamentals of Electrical Engineering (V. K. Mehta).
6. Electrical Machines (by Dr. S. K. Bhattacharya)

**Websites:** [www.google.com](http://www.google.com),

[www.wikipedia.com](http://www.wikipedia.com),

[www.electrical4u.com](http://www.electrical4u.com).

**Course ID:**  
**Course Name** : CAD and Electric Drawing  
**Course Code** : EEF308  
**Course Abbreviation** : FCAD  
**Pre-requisites** : nil

**Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	01	03
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (External)	
Details of Evaluation	-	i) 50 marks for continuous assessment ii) One PST of 50 marks	-	As per Proforma	As per Proforma	
Marks	-	-	-	50	25 I	75

**Rationale**

The electrical technician / supervisor are called upon to draw or interpret drawings of electrical systems that include machines, control panels, power system components such as transmission and distribution systems etc. This course aims to provide hands on practice in freehand sketches; drawing using relevant tools and computer based software. The course also provides practice to read and interpret electrical engineering drawings.

**Competency**

The aim of this course is to help the student to attain the following industry and field related competency;  
**Use CAD for creating and editing electrical engineering related drawings.**

**Course outcomes (COs)**

- EEF308-1. Draw symbolic representation of electrical components manually.
- EEF308-2. Sketches, isometric and orthographic views of electrical machines and components.
- EEF308-3. Use CAD tools to draw simple electrical objects.
- EEF308-4. Create electrical CAD drawings.
- EEF308-5. Edit electrical drawings in CAD.

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

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" : no correlation ]

Semester IV Competency and COs	PO 1 Basic knowled ge	PO 2 Disciplin e knowled ge	PO 3 Experim ents and practice	PO 4 Engineer ing Tools	PO 5 The engineer and society	PO 6 Environ ment and sustainab ility	PO 7 Ethics	PO 8 Individua l and team work:	PO 9 Commun ication	PO 10 Life- long learning	PSO1 Electrica l Equipmen t	PSO2 Electric power systems
<b>Competency:</b> Use Electrical Drawing and CAD skills in the fields of Electrical Engineering.	3	3	3	3	1	-	1	1	2	2	2	2
EEF308-01 Draw / Identify symbolic representation of electrical components.	3	3	3	3	1	-	1	2	2	3	3	3
EEF308-02 Draw free hand sketches, isometric and orthographic views of electrical machines.	3	3	3	1	1	-	1	1	2	2	3	3
EEF308-03 Use CAD tools to draw simple objects.	3	3	3	3	1	-	1	1	2	1	2	2
EEF308-04 Create electrical CAD drawing files.	3	3	3	3	1	-	1	1	2	3	1	1
EEF308-05 Edit drawing in electrical CAD.	3	3	2	3	1	-	-	1	2	2	2	2

**CONTENTS:****A) THEORY**

Sr. no	Topics/sub-topics	Hours
1	Use of different electrical and electronics symbols as per IS: 1032 or new equivalent IS.	1
2	2.1 Need for free hand sketching with its importance. Draw and interpret freehand sketches of electrical machine parts or electrical components. 2.2 Orthographic projections of simple parts. Draw and interpret orthographic Projection of electrical machine parts or electrical components. 2.3 Isometric projections of simple parts. Draw and interpret the isometric Projections of Electrical Machine parts or electrical components.	3
3	3.1 Components of CAD classic screen, Identify components of CAD classic screen. 3.2 Menu bar and status bar. Identify components of CAD screen. 3.3 CAD tool bar. Identify toolbar and commands.	3
4	4.1 Absolute Coordinate Method: Commands: LIMITS, UNITS, LINE and ARC. Interpret line diagram using absolute coordinate method. 4.2 Relative coordinate Method: Commands: LIMITS, UNITS, LINE and ARC. Interpret line diagram using relative coordinate and relative polar coordinate method. 4.3 Relative polar coordinate method: Commands: LIMITS, UNITS, LINE and ARC. Interpret 2D figures using Draw and Modify commands. Use commands in CAD. 4.4 2D figures: Commands: LINE, CIRCLE, OFFSET, TRIM, FILLET, ARC, POLYGON, ELLIPSE, COPY, MIRROR, TRIM, ROTATE and CHAMFER.,.	6



Sr. no	Topics/sub-topics	Hours
	4.5 Isometric drawings: commands: LIMITS, UNITS, ZOOM, GRID, SNAP, LINE, COPY, ISOPLANE, ELLIPSE, TRIM, ERASE, PROPERTIES and SAVE. Interpret isometric drawing of electrical machine in CAD	
5	Applications of electrical CAD software to: Draw circuit diagrams and layouts. 5.1 Use of electrical CAD to draw the given electrical circuit diagram. 5.2 Use of electrical CAD to prepare layout of the 11 kV/400 V distribution substation. 5.3 Use electrical CAD to draw layouts of two types of earthing systems.	3

**B) PRACTICALS**

S. No.	Practical Exercises	Course Outcomes
	<b>Using manual drawing tools</b>	
1	Draw different electrical (including electronics) symbols using drawing instruments as per IS: 1032 or new equivalent IS.	EEF308-01
2	Draw the freehand drawing of Electrical Machine parts and electrical components.	EEF308-02
3	Draw the orthographic Projection of Electrical Machine parts or electrical components.	EEF308-02
4	Draw the isometric Projection of Electrical Machine parts or electrical components.	EEF308-02
5	Draw labeled layouts of two types of electrical earthing systems.	EEF308-03
	<b>Using CAD software</b>	
6	Locate components of CAD classic screen by creating new drawing: a. CAD screen layout, drawing area, menu and toolbars, status bar b. Working with toolbar and commands, changing drawing limits, creating rectangle etc. saving drawing for first time.	EEF308-03
7	Draw a line diagram using absolute coordinate method. Use LIMITS, UNITS, LINE, ARC Commands: a. Absolute coordinate method b. Drafting set-up: units, angle, area, coordinate system, limits, grid, object snap c. Creating two dimensional drawings using draw commands- line and arc.	EEF308-03
8	Draw a line diagram using relative coordinate and relative polar coordinate method. Use LIMITS, UNITS, LINE, ARC, Commands: a. Relative coordinate and relative polar coordinate method b. Draft set-up: units, angle, area, coordinate system, limits, grid, object snap c. Create two dimensional drawings using draw commands-line and arc.	EEF308-03
9	Draw a 2D figure using Draw and Modify commands. Use LINE, CIRCLE, OFFSET, TRIM, FILLET commands: a. Create two dimensional drawings using draw commands- line and circle b. Modify two dimensional drawings using modify commands- offset,	EEF308-04

S. No.	Practical Exercises	Course Outcomes
	trim, fillet	
10	Draw a 2D figure using Draw and Modify commands. Use LINE, ARC, POLYGON, ELLIPSE, COPY, MIRROR, TRIM, ROTATE, CHAMFER commands: a. Create two dimensional drawings using draw commands- line, arc, polygon, ellipse. b. Modify two dimensional drawings using modify commands- copy, mirror, trim, rotate, chamfer.	EEF308-04
11	Draw isometric drawing of electrical machine. Use LIMITS, UNITS, ZOOM, GRID, SNAP, LINE, COPY, ISOPLANE, ELLIPSE, TRIM, ERASE, PROPERTIES, SAVE commands, a. Draft set-up: units, limits, zoom, grid, object snap, ortho mode b. Snap and grid- snap spacing, grid spacing, isometric snap type	EEF308-05
12	Create a simple drawing using electrical CAD software for the given electrical circuit diagram.	EEF308-05
13	Draw the layout of the 11 kV/400 V distribution substation using electrical CAD software.	EEF308-05

**Criteria for assessment of practical works:**

Sr. No.	Performance Indicators	Weightage
1	Planning of the drawing.	10
2	Selection of relevant drawing / software tools.	10
3	Drawing skills judged by neatness and correctness.	10
4	Timely submission.	10
5	Answer to sample questions.	10
<b>Total</b>		<b>50</b>

**SPECIFICATION TABLE FOR THEORY PAPER**

Not Applicable –

**SUGGESTED STUDENT ACTIVITIES**

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

- Collect information on different available electrical CAD software.
- Read at least three different electrical drawings other than those covered in the practicals above.

**SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES**

Audio visual shows during initial practical hours must be used for effective interest generation for skill development in this area.

**SUGGESTED MICRO-PROJECTS (OPTIONAL)**

(Micro-projects could be added by the concerned faculty):

- a. **2D Transmission:** Each batch will identify fasteners, couplings; joints used in electric motors and using CAD software prepare drawings. The figures should be labeled and dimensioned using software.
- b. **2D Electric Machine Components:** Each batch will identify electric machine components and using CAD software and prepare drawings. The figures should be labeled and dimensioned using software.
- c. **3D Transmission:** Each batch will identify fasteners, couplings; joints used in electric machines and using CAD software and prepare isometric drawings. The figures should be labeled and dimensioned using software.
- d. **3D Electric Machine components:** Each batch will identify electric machine components and using CAD software and prepare isometric drawings. The figures should be labeled and dimensioned using software.
- e. **Digital Drawings:** Each batch will identify manual drawings of electric machine components using CAD software and create digital drawings using relevant software

### SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Electrical Engineering Drawing	Bhattacharya, S. K.	New Age International, New Delhi, 2005, ISBN: 81-224-0855-9
2	Electrical Drawing	Narang, K. L.	Satyaprakashan, New Delhi, 2015 ISBN: 81-7684-150-1
3	Electrical Drawing	Singh, Surjeet	SK Kataria and Sons, New Delhi, ISBN: 8177000454
4	AutoCAD 2016 exercise workbook for windows	Shrock, Cheryl R. and Heather, Steve,	Industrial Press Inc. South Norwalk, USA, First, 2016 ISBN: 978-0-8311-3518-8
5	Engineering Drawing with introduction to AutoCAD	Jolhe, Dhananjay A,	Tata McGraw-Hill Co. Ltd., New Delhi, 2nd, 2008 ISBN: 978-0-07-064837-1
6	AutoCAD 2016 and AutoCAD LT 2016	Gladfelter, Donnie,	John Wiley and Sons. Inc. Indiana, First, 2016 ISBN: 978-1-119-05955-4

### SOFTWARE/LEARNING WEBSITES

- a. [www.mycadsite.com/tutorials/level\\_3/isometric-drawing-in-autocad-3-2.htm](http://www.mycadsite.com/tutorials/level_3/isometric-drawing-in-autocad-3-2.htm) accessed on 27<sup>th</sup> June, 2016
- b. [www.cadlearning.com/courses/autocad-mechanical-training-tutorials/](http://www.cadlearning.com/courses/autocad-mechanical-training-tutorials/), accessed on 27<sup>th</sup> June, 2016
- c. [www.staff.city.ac.uk/~ra600/ME1105/Tutorials/CAD-1/Tutorial%20CAD-1a.pdf](http://www.staff.city.ac.uk/~ra600/ME1105/Tutorials/CAD-1/Tutorial%20CAD-1a.pdf), accessed on 28<sup>th</sup> June, 2016
- d. [www.youtube.com/watch?v=yruPUj\\_61bw](http://www.youtube.com/watch?v=yruPUj_61bw), accessed on 29<sup>th</sup> June, 2016
- e. [www.youtube.com/watch?v=Nv8skZZcUlw](http://www.youtube.com/watch?v=Nv8skZZcUlw), accessed on 29<sup>th</sup> June, 2016
- f. [www.youtube.com/watch?v=Lz6piHIBn7g](http://www.youtube.com/watch?v=Lz6piHIBn7g), accessed on 30<sup>th</sup> June, 2016

**COURSE ID :**

**Course Name** : Applied Electronics  
**Course Code** : EEF 309  
**Course Abbreviation** : FAET  
**Pre-requisite Course(s)** : EEF303

**TEACHING AND EVALUATION SCHEME :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical 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-VI	As per Proforma-V	
Marks	20	--	80	25	50 I	175

I-Internal Examination , \*\*Assessment as per Pro-forma V, Term Work Assessment as per Pro-forma VI

**RATIONALE :**

Electronic circuits are most widely used in industries, power systems, communication systems etc. The skills of operating/working on various types of electronic circuits and their applications are needed for every electrical engineer. This course aims to arm the diploma in electrical engineering pass outs with these skills of applying the electronic devices based on oscillators, multi vibrators, SCRs and power semi conductors in the industries in relevant situations.

**Course Competency:** Use different power electronics application circuits.

**Cognitive:** Understand the different electronic circuits used in industries.

**Psychomotor:** Use the relevant electronic circuits in industrial applications following safe practices.

**Affective:** Attitude of i) safety ii) accuracy iii) aestheticism in works.

**Course Outcomes:**

- EEF309-1. Prepare set up & use single, multi stage and power amplifiers in different applications.
- EEF309-2. Use different sinusoidal oscillators electronic circuits.
- EEF309-3. Prepare BJT switching circuits & use them in multivibrator circuits.
- EEF309-4. Use Power semiconductor devices in different electronic applications.
- EEF309-5. Implement different SCRs commutation circuits.
- EEF309-6. Implement different circuits for phase control.

## 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	PSO1 Electrical Equipment	PSO2 Electric power systems
Competency: Use different power electronics application circuits.	2	3	3	2	1	—	—	2	2	3	3	2
EEF309-1. Prepare set up & use single, multi stage and power amplifiers in different applications.	2	3	3	2	1	—	—	2	2	3	3	2
EEF309-2. Use different sinusoidal oscillators in electronic circuits.	2	3	3	2	1	—	—	2	2	3	3	2
EEF309-3. Prepare BJT switching circuits & use them in multivibrator circuits.	2	3	3	2	1	—	—	2	2	3	3	2
EEF309-4. Use Power semiconductor devices in different electronic applications.	2	3	3	2	1	—	—	2	2	3	3	2
EEF309-5. Implement different SCRs commutation circuits.	2	3	3	2	1	—	—	2	2	3	3	2
EEF309-6. Implement different circuits for phase control	2	3	3	2	1	—	—	2	2	3	3	2

### CONTENTS :

#### A. THEORY :

##### Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>EEF309-1. Prepare set up &amp; use single, multi stage and power amplifiers in different applications.</i>			
<b>1</b>	<b>Amplifiers</b> 1.1 Single Stage Amplifier 1.1.1 Transistor as an Amplifier 1.1.2 CB,CE & CC configurations: Circuit diagram , input/output characteristics of CE only 1.1.3 Transistor biasing methods: Circuit diagram and working 1.1.4 Load line analysis of CE amplifier 1.2 Multistage Amplifiers: Circuit diagram ,working and frequency response of	<b>12</b>	<b>16</b>

	1.2.1 RC coupled Amplifier 1.2.2 Transformer coupled Amplifier 1.2.3 Direct-coupled Amplifier 1.3 Power Amplifiers 1.3.1 Properties & working of class A&B 1.3.2 Class B push pull Amplifier		
<i>EEF309-2. Use different sinusoidal oscillators in electronic circuits.</i>			
<b>2</b>	<b>Sinusoidal Oscillators</b> 2.1 Feedback in oscillators 2.2 Barkhausen Criteria 2.3 Transistor circuit ,working, frequency formula of following 2.3.1 RC-phase shift oscillator 2.3.2 Tuned circuit oscillators 2.3.3 Colpitts oscillator 2.3.4 Hartley oscillator 2.3.4 Tuned collector oscillator 2.3.5 Tuned base oscillator 2.3.6 Crystal oscillator 2.3.7 Clapp's oscillator. 2.4 Frequency stability.	<b>06</b>	<b>12</b>
<i>EEF309-3. Prepare BJT switching circuits &amp; use them in multivibrator circuits.</i>			
<b>3</b>	<b>BJT Switching Circuits</b> 3.1 Transistor as a switch 3.2 switching times in a transistor 3.3 Transistor circuit ,working of following 3.3.1 Bistable multivibrator 3.3.2 Emitter coupled bistable multivibrator or Schmitt trigger 3.3.3 Monostable multivibrator 3.3.4 Astable multivibrator. Calculations based on timing equations.	<b>06</b>	<b>12</b>
		<b>24</b>	<b>40</b>

## Section II

<i>EEF309-4. Use Power semiconductor devices in different electronic applications.</i>			
<b>4</b>	<b>Power Semiconductor Devices</b> 4.1 Construction, operation , characteristics, specifications and applications of: 4.1.1 Power transistor 4.1.2 MOSFET 4.1.3 IGBT 4.1.4 PUT 4.1.5 UJT 4.1.6 DIAC, TRAIC-anti-parallel connection of SCR 4.2 SCR-two transistor analogy 4.3 turn on methods 4.4 dynamic turn on-off characteristics 4.5 Comparison of SCR, MOSFET and IGBT.	<b>10</b>	<b>12</b>

<i>EEF309-5.Implement different SCR commutation circuits.</i>			
<b>5</b>	<b>Commutation of SCR</b> 5.1 Thyristor commutation: 5.1.1 line commutation 5.1.2 load commutation 5.1.3 forced commutation 5.1.4 External pulse commutation. 5.2 Circuit diagram , operation and waveforms of following : Class A, B, C, D, E and F commutation.	<b>06</b>	<b>14</b>
<i>EEF309-6.Implement different circuits for phase control.</i>			
<b>6</b>	<b>Phase Control</b> 6.1 Phase control by R, RC - half wave, RC - full wave 6.2 UJT, PUT, ramp and pedestal triggering circuits. 6.3 Firing of Triac using Diac. 6.4 Thyristor Protection; 6.4.1 Factors causing damage to thyristor: over voltage, over current. 6.4.2 Protection for dv/dt and di/dt 6.4.3 gate protection 6.4.4 snubber circuits.	<b>08</b>	<b>14</b>
		<b>24</b>	<b>40</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**B] Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Course outcomes	Total marks
		Knowledge	Comprehension	Application		
I/1	Amplifiers	04	04	08	EEF309-1	16
I / 2	Sinusoidal Oscillators	04	04	04	EEF309-2	12
I / 3	BJT Switching Circuits	04	04	04	EEF309-3	12
I / 4	Power Semiconductor Devices	04	04	04	EEF309-4	12
II / 5	Commutation of SCR	04	04	06	EEF309-5	14
II / 6	Phase Control	02	08	04	EEF309-6	14
	Total:	22	28	30		80

**C] Practical works and related skills developed.(Any ten experiments)**

Sr. no	Practical works	Skills developed	Course outcomes
1	Static characteristics of transistor in CE configuration.	1) Students will be able to understand transistor CE Configuration. 2) Students will be able to understand How transistor works as an Amplifier ? 3) Students will be able to understand Why CE configuration is suitable for an amplifier ?	EEF309-1
2	Hartley oscillator using BJT: frequency calculation.	1) Implement oscillator circuits 2) Determine the oscillation frequency theoretically & verify practically.	EEF309-2
3	RC phase shift oscillator using BJT: frequency calculation.	1) Implement oscillator circuits 2) Determine the oscillation frequency theoretically & verify practically.	EEF309-2
4	Astable multivibrator using transistor: time measurement and calculations.	1) Implement astable multi vibrator circuit. 2) Generate square waves. 3) Determine the time period/ frequency theoretically & verify practically.	EEF309-3
5	Monostable multivibrator using transistor: time measurement and calculations.	1) Implement monostable multi vibrator circuit. 2) Generate pulses. 3) Determine the time period/ frequency theoretically & verify practically.	EEF309-3
6	Bistable multivibrator using transistor	1) Implement bistable multivibrator. 2) Generate square waves. 3) Determine the time period/ frequency theoretically & verify practically.	EEF309-2
7	Schmitt trigger using transistor	1) Implement Schmitt trigger circuit. 2) Plot hysteresis loop for Schmitt trigger. 3) Convert input waveform into the square wave.	EEF309-3
8	SCR Characteristics	1) Use SCRs. 2) Determine SCR characteristics.	EEF309-4
9	PUT Characteristics	1) Use PUT. 2) Determine PUT characteristics.	EEF309-4
10	SCR Commutation (Any one)	Implement commutation circuits for SCR.	EEF309-5
11	Gate Triggering Circuits(any two)	Make and implement gate triggering circuits.	EEF309-6



**D] Criteria for Continuous Assessment of Practical work and Progressive skill Test :****i. Progressive Skills 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

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

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

Assessment at semester end practical exam as per Pro-forma V

**E] 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.

**F] Text Books:**

Sr. No.	Name of Book	Author	Publisher
1.	Applied electronics	R.S.Sedha	S. Chand and Co.
2.	Electronics principles	A.P.Malvino	Tata McGraw-Hill
3	Applied electronics	G.K.Mithal	Khanna
4	Basic electronics	B.L.Theraja	S. Chand and Co.
5	Principles Of Electronics	V.K.Mehta	S. Chand and Co.

**Course ID :**

**Course Name** : **Transmission & Distribution of Electric Power.**  
**Course Code** : **EEF 310**  
**Course Abbreviation** : **FTDP**  
**Pre-requisites** : **EEF306**

**Teaching and Evaluation Scheme:****Teaching Scheme:**

scheme component	Hours / week	Credits
Theory	03	06
Practical	02	
Tutorial	01	

**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 50 marks	Term End Theory Exam (03 hours)	As per Proforma -III	---	
Marks	20	--	80	25	---	125

**Rationale:**

To work in Electrical transmission-distribution systems a technician must be well equipped with the basic knowledge and skills.. It is also important to study the line constants and performance of transmission lines. The technician must also be well conversant with the transmission systems both HVDC and HVAC.

He /she should be able work on the equipment, accessories of distribution systems. He /she should be empowered in respect of their consumers, tariffs, energy billing systems, power factor improvement of power distribution.

**Course Competency:** Carryout various functions as a technician involved in electrical transmission & distribution systems.

**Cognitive** : Understand working of Electrical Transmission & Distribution systems.

**Psychomotor** : To carryout various types of operation and maintenance activities in substation.

**Affective** : To develop attitude of safety, accuracy and punctuality for work

**Course Outcomes :**

- EEF 310- 1: Carry out installation, monitoring and to maintain all type of lines.  
 EEF 310- 2: Maintain over head lines considering their electrical aspects.  
 EEF 310- 3: To interpret layouts and solutions for problems or faults, to maintain distribution line.  
 EEF 310- 4: Assist in maintaining HVDC substation.  
 EEF 310- 5: Operate and maintain AC and DC distribution system.  
 EEF 310- 6: Carryout energy billing works.  
 EEF 310- 7: Operate and maintain distribution substation.

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

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

<b>Competency and COs</b>	<b>PO 1 Basic knowledge</b>	<b>PO 2 Discipline knowledge</b>	<b>PO 3 Experiments and practice</b>	<b>PO 4 Engineering Tools</b>	<b>PO 5 The engineer and society</b>	<b>PO 6 Environment and sustainability</b>	<b>PO 7 Ethics</b>	<b>PO 8 Individual and team work:</b>	<b>PO 9 Communication</b>	<b>PO 10 Life-long learning</b>	<b>PSO1 Electrical Equipment</b>	<b>PSO2 Electrical Power systems</b>
<b>Competency</b> Carryout various functions as a technician involved in Electrical Transmission & Distribution systems.	3	3	3	2	3	1	—	2	2	2	3	3
<b>EEF 310-1 :</b> Carry out installation, monitoring and to maintain all type of lines.	3	3	2	2	2	1	—	3	3	2	3	3
<b>EEF 310-2 :</b> Maintain over head lines considering their electrical aspects.	3	3	3	3	2	1	—	3	3	3	3	2
<b>EEF310-3 :</b> Carry out calculations to judge the performance of short lines and appreciate in principle the working of medium / long lines.	2	3	3	2	1	—	—	2	2	2	3	3
<b>EEF310-4 :</b> Assist in maintaining HVDC substation.	3	3	1	2	3	1	—	2	2	2	1	2
<b>EEF310-5 :</b> Operate and maintain AC and DC distribution system.	3	3	2	2	3	1	—	2	2	2	2	2
<b>EEF310-6 :</b> Carryout energy billing works.	2	2	1	2	2	—	—	3	2	2	2	2
<b>EEF310- 7 :</b> Operate and maintain distribution substation.	2	2	1	2	2	1	—	2	2	2	2	2

**A] CONTENTS:****Section-I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF 310- 1: Carry out installation, monitoring and to maintain all type of lines.			
1	<b>MECHANICAL ASPECTS OF OVER HEAD LINES</b> Main components of overhead lines. 1.1. Conductor types- Copper, Aluminum & their trade names. Solid, stranded & bundled conductors and line supports. 1.2. Insulators & their types. 1.3. Potential distribution over suspension insulator string 1.4. String efficiency & methods of improving string efficiency ( For 03 disc string). 1.5. Sag in overhead lines. 1.6. Calculations of sag: effect of wind and ice loading, Considering line top at the same height.	04	10
EEF 310- 2: Maintain over head lines considering their electrical aspects.			
2	<b>ELECTRICAL ASPECTS OF OVERHEAD LINES</b> 2.1 Constants of transmission lines - R, L, C( single phase and three phase overhead lines) 2.2 Skin effect, Proximity effect, Ferranti effects in transmission systems. 2.3 Corona and factors influencing it. 2.4 Important terms: critical disruptive voltage, visual critical voltage. 2.5 Advantages, disadvantages and methods of reducing corona.	08	12
EEF 310- 3: Carry out calculations to judge the performance of short lines.			
3	<b>PERFORMANCE OF TRANSMISSION LINES</b> 3.1 Classification of overhead lines based on voltage and length. 3.2 Calculations of regulation and efficiency of single and three phase short lines. (Simple numerical). 3.3 Effect of load factor on regulation and efficiency 3.4 Medium transmission line representation: End condenser, Nominal T and $\pi$ ( Phasor diagrams only) 3.5 Introduction to Long transmission lines.	10	12
EEF 310- 4: Assist in maintaining HVDC substation.			
04	<b>HIGH VOLTAGE DC TRANSMISSION</b> 4.1 Principle of HVDC system. 4.2 Types of DC link. (Block diagram & description) 4.3 Economic distances for DC Transmission. 4.4 Comparison with AC Transmission.	02	06
	<b>TOTAL</b>	24	40

**Section –II**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF 310- 5: Operate and maintain AC and DC distribution system.			
05	<b>FUNDAMENTALS OF DISTRIBUTION SYSTEM.</b> 5.1 Design considerations in distribution System. 5.2 D.C. distribution. 5.3 Methods of obtaining 3-wire D.C. System. 5.4 Connection schemes of distribution system. 5.5 A.C. Distribution. 5.6 A.C. Distribution calculations. (Simple numerical)	10	16
EEF 310- 6: Carryout energy billing works.			
06	<b>ECONOMICS OF POWER DISTRIBUTION</b> 6.1 Types of tariff. (Numericals on energy billing) 6.2 Desirable characteristics of tariff. 6.3 Causes and drawbacks of low power factors. 6.4 Calculations of Power Factor correction. (Numericals ) 6.5 Most economical Power Factor. ( Numericals ) 6.6 To meet the increased kW demand on Power Stations. (Numericals )	08	16
EEF 310- 7: Operate and maintain distribution substation.			
07	<b>SUBSTATIONS ( Distribution)</b> 7.1 Classification with features of indoor & outdoor sub-stations. 7.2 Selection & location of site. 7.3 Main connection schemes. 7.4 Equipment in substations. 7.5 Connection diagram and layout of sub-stations.	06	8
<b>TOTAL</b>		24	40

**B] Term Work:**

Sr. no	Practicals	Skill to be developed	Course outcome
1	Drawing sheet: Labeled sketches of various types of Insulators.	1] Selection of different types of insulators. 2] Specifications.	EEF 310-1
2	Assignment on string efficiency and methods of improvement.	1] String efficiency: improvement and calculations.	EEF 310-1
3	Drawing sheet: Labeled sketches of supporting structures - poles and towers. Drawing sheet: Labeled sketches of	1] Selection of tower and poles 2] Identify materials.	EEF 310-2

	substations.		
4	Assignment on sag calculations.	1] Sag calculation	EEF 310-3
5	Drawing sheet: Methods of obtaining 3-wire D.C. System with connection schemes of distribution System.	1] Components of 3 wire DC system. 2] Different schemes.	EEF 310-3
6	Writing report on web searched information of HVDC Transmission system.	1] Web searching techniques. 2] Components of HVDC Transmission.	EEF 310-4
7	Drawing sheet: 3-wire, 4- wire A.C. System with various connection schemes of Distribution System.	1] Components of 3 wire , 4 wire AC system	EEF 310-5
8	Assignment on various methods of improvement of power factor in A.C. System. Coping with increased KW demand on power substation.	1] Power factor improvement schemes. 2] Problems on increased demand on power station.	EEF 310-6
9	Assignment: feeder load calculations in AC Distribution System.	1] AC Feeder calculations.	EEF 310-6
10	Power Point presentation on any one of above topic (Distribution substation, components, switchgear, earthing, etc.)	1] PowerPoint soft skill. 2] Presentation methods.	EEF 310-7

**C] Industrial exposure :**

Industrial visits to different types of sub-stations to be arranged.

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

Section / Topic no.	Name of topic	Distribution of marks Cognitive base (level wise)			Course outcome	Total marks
		Remember	Understand	Application		
I / 1	Mechanical aspect Of Over Head Lines	04	02	04	EEF 310-1	10
I / 2	Electrical aspect Of Overhead Lines	04	04	04	EEF 310-2	12
I / 3	Performance Of Transmission Lines	02	04	06	EEF 310-3	12
I / 4	High voltage DC Transmission	02	04	-	EEF 310-4	06
II / 5	Fundamentals of Distribution System.	04	04	08	EEF 310-5	16
II / 6	Economics of Power distribution	04	04	08	EEF 310-6	16
II / 7	Distribution substation	02	02	04	EEF 310-7	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.

**Assessment criteria for term work:****i) Continuous Assessment of Practical Assignments:**

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

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

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 50 marks

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

**Instructional Methods :**

1. Lectures cum Demonstrations
2. Classroom practices.

**Teaching and Learning resources :**

1. Chalk board
2. LCD presentations.
3. Demonstrative kits.
4. Demonstrative charts.

**Reference Books:**

- a) Principles of Power Systems (by V. K. Mehta)
- b) Electrical Power (by Dr. S. L. Uppal).
- c) Electrical Power (by Joshi, Gupta, Bhatnagar).
- d) Electrical Power (by C.L.Wadhava).

**Websites:** i) [www.google.com](http://www.google.com) ii) [www.wikipedia.com](http://www.wikipedia.com)

**Course ID :****Course Name : Entrepreneurship Development and Technical Writing****Course Code : EEF311****Course Abbreviation : FEDW****Pre-requisite Course(s) : NIL****Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	01	03
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral/ Practical Examination (Internal)	
Details of Evaluation		i. 25 marks for each practical ii. One PST of 50 marks		As per Proforma-VI	As per Proforma-V	
Marks	-	--	-	50	25 I	75

**Rationale:**

In the global market and economy of the date, innumerable opportunities have opened for the technicians. On the other side, the same situation has brought in many challenges. The student requires being equipped with the competencies to take benefit of the opportunities and also the strength to meet the challenges. This course is designed to make the student aware about his own professional career and provide exposure to the world of Entrepreneurship. Whether or not he starts his own enterprise, it is necessary for every student to have a bird's eye view of the whole industrial scenario and the related issues as that is going to be his future professional world. Also this course tries to enhance the technical writing skills of student to make him better equipped to face the situations of report writing etc.

**Competency**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- **Become an entrepreneur with good technical writing skills.**

**Cognitive:** Understand and appreciate the characteristics of good entrepreneur.

**Psychomotor:** Write and report on various technical matters.

**Affective:** Attitudes of social and moral responsibility.

**Course Outcomes:**

EEF311-1. Plan ones career.

EEF311-2. Appreciate the effect of globalization on world markets and national industrial polices.

EEF311-3. Attempt to become an entrepreneur.

EEF311-4. Use the tool of enterprise planning along with project feasibility reports.

EEF311-5. Carry out elementary activities related to financial analysis and accounting.

EEF311-6. Devise marketing strategies.

EEF311-7. Develop and manage an enterprise.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**



[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” : 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 teamwork	PO 9 Communication	PO 10 Life-long learning	PSO1 Electrical Equipment	PSO2 Electrical power systems
<i>Competency:</i> Become an entrepreneur with good technical skills.	3	—	2	1	2	2	2	2	3	3	2	2
EEF311-1: Plan ones career	3	—	3	1	3	2	2	2	3	3	2	2
EE311-2 Appreciate the effect of globalisation on world markets and national industrial policies	3	—	2	1	2	3	2	1	3	3	—	—
EE311-3 Attempt to become an entrepreneur	3	—	2	1	2	2	2	2	3	3	2	2
EE311-4 Use the tool of enterprise planning along with project feasibility reports	2	—	2	1	2	1	2	2	3	3	2	2
EE311-5: Carry out elementary activities related to financial analysis and accounting	3	—	2	1	2	3	2	2	3	3	2	2
EE311-6: Devise marketing strategies	2	—	2	2	1	2	2	2	1	3	2	2
EE311-7: Develop and manage an enterprise	1	—	2	2	2	1	3	2	3	3	3	3

## Contents :

### A: THEORY

S. No.	TOPICS Sub-Topics	Lectures (hours)
<i>EEF311-1. Plan ones career.</i>		
1.	<b>Career Planning</b> 1.1 Professional Career: Concept and definition. Occupation, profession and business. 1.2 Importance of career planning, goal setting. 1.3 Various career options for a diploma technician 1.4 Factors affecting choice of career: Personal factors – personality and competencies, family background, individual strengths and constraints, etc. External factors – Market situation and future trends, etc. 1.5 Preparing a career plan : Concreteness and flexibility of a career plan. 1.6 Factors affecting choice of career: Personal factors – personality and competencies, family background, individual strengths and constraints, etc. External factors – Market situation and future trends, etc. 1.7 Preparing a career plan : Concreteness and flexibility of a career plan	04
<i>EEF311-2. Appreciate the effect of globalisation on world markets and national industrial policies.</i>		
2.	<b>Globalization, World Market and National Industrial Policies</b> 2.1 Globalization and world market : Concept and phenomenon. 2.2 Influences of globalization on developing countries 2.3 Policies of Union and State Government on industrialization	02

S. No.	TOPICS Sub-Topics	Lectures (hours)
	and marketing 2.4 Various statutory bodies like DIC, MCED, MITCON, etc. formed by the Government 2.5 Various Government schemes like Prime Minister's employment scheme etc.	
<i>EEF311-3. Attempt to become an entrepreneur.</i>		
3.	<b>Entrepreneurship</b> 3.1 Characteristics of an entrepreneur 3.2 Advantages and risks for an entrepreneur 3.3 Resources required for an enterprise 3.4 Growing an enterprise 3.5 Professionalism 3.6 Biographies of at least four great entrepreneurs	02
<i>EEF311-4. Use the tool of enterprise planning along with project feasibility reports.</i>		
4.	<b>Enterprise Planning, Technical writing and Project Report</b> 4.1 Steps in starting an enterprise : Individual SWOT analysis and personality factors assessment, emerging market trends and market opportunities survey, feasibility analysis 4.2 Technical writing: technical submissions, test reports, reporting events such as accidents, malfunctioning of technical systems, 4.2 Project Report: Contents of project report. Proforma of a Project report considering mini project.	04
<i>EEF311-5. Carry out elementary activities related to financial analysis and accounting.</i>		
5.	<b>Financial Analysis and Accounting</b> 5.1 Cost of project : Sources of finance. Assessment of working capital. Product costing. Profit and break even analysis. Financial ratios and their significance. 5.2 Financing Institutions 5.2 Business Accounting : Accounting principles and methodology.	02
<i>EEF311-6. Devise marketing strategies.</i>		
6.	<b>Market Assessment and Marketing</b> 6.1 Definition of market and marketing 6.2 Marketing channels and strategies 6.3 E-commerce	01
<i>EEF311-7. Develop and manage an enterprise.</i>		
7.	<b>Enterprise Management and Development</b> 7.1 Resources management 7.2 Quality standards : ISO 7.3 Professional ethics, environmental protection, social aspects	01

**B: Termwork****Laboratory Experiences**

Sr. No	Practical work	Skills / Competencies to be developed	CO
1.	Goal setting and career planning for myself	Self-analysis and concept application	EEF311-1
2.	Exercise on working on a group task	Working in a group and leadership	EEF311-2
3.	Report writing on technical issues: project progress, task completions, testing reports, acceptance reports for equipment etc. Considering mini project	Writing / reporting on technical issues.	EEF311-4
4.	Group discussion on issues related to globalization	Discussing given problem in all dimensions	EEF311-2
5.	Group discussion on issues related to impact of globalization on India		EEF311-2
6.	Survey of industrial environment of Kolhapur with reference to particular engineering discipline	Carrying out a survey. Getting awareness of industrial scenario.	EEF311-3,4
7.	Internet based information search and presentation of biography of two great entrepreneurs in particular engineering discipline	Analysis and inspiration	EEF311-3
8.	Me as a future entrepreneur : self SWOT analysis	Self-analysis and concept application	EEF311-4
9.	Brain storming exercise for generating creating ideas for products	Generating creative business ideas and evaluating them	EEF311-4,6
11.	Interviewing an entrepreneur	Interviewing Analyzing situations	EEF311-3
12.	Sample project report preparation	Undergoing complete sample exercise for starting a new enterprise	EEF311-4,5

**Instructional Strategies:**

1) Lectures cum Discussions.      2) Experts' guest Lectures.

**Learning Resources:**

1. Chalkboard, 2.. O.H.P. 3. Slides, 4. Audio tapes, 5. Video films. 6. Internet

**Criteria for Continuous Internal Assessment:**

(Each practice assignment shall be evaluated as mentioned below)

	Particulars	Marks
1.	Sincerity and effort	10
2.	Extent of achievement of objectives of assignment	10
3.	Presentation	05
	Total	25

**Criteria for assessment in oral examination:**

1. Oral examination will be conducted by an internal examiner (the course teacher) and an external examiner (course teacher from a different programme of the Institute)
2. The oral examination shall be based on the term-work presented by the student.

**Reference Books :**

1. Entrepreneurship - Theory and Practice : J.S.Saini and B.S.Rathore (Wheeler Publisher)
2. Entrepreneurship Development : TTTI Chandigarh
3. Entrepreneurship Development : E. Gordon / K.Natrajan (Himalaya Publishing)
4. A manual on How to prepare a project report: J.B.Patel and D.G.Allampally
5. A manual for business opportunity identification and selection: J.B.Patel and S.S.Modi
6. National Directory of Entrepreneur Motivator & Resource Persons: S.B.Sareen & H. Anil . K
7. A handbook of new entrepreneurs : P.C.Jain
8. The seven business crisis and how to beat them: V.G.Patel

**Video Cassettes :**

Following video cassettes are available at EDI Study Material, Near Village Bhat, Via Ahmedabad Airport and Indra Bridge, PO Bhat 382428, Ahmedabad

Phone – 079-3969163 / 3969153. E-mail : [ediindia@sancharnet.in](mailto:ediindia@sancharnet.in) / [olpe@ediindia.org](mailto:olpe@ediindia.org) )

1. Five success stories of first generation entrepreneurs
  2. Assessing entrepreneurial competencies
  3. Business opportunity selection and guidance
  4. Planning for completion and growth
  5. Problem solving – an entrepreneurial skill
-

**Course Name** : BASIC MECHANICAL AND CIVIL ENGINEERING  
**Course Code** : EEf 312  
**Course Abbreviation** : FBMC  
**Pre-requisite Course(s)** : NIL

**Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	4	6
Practical	2	

**Evaluation Scheme:**

Component	Progressive Assessment		Semester end		Total
	Theory	Practical	Theory	TW*	
Duration	Two tests (1 hour each)	Two Skill Tests of 25 marks each for both sections	One paper (3 hours)	As per Proforma III	
Marks	20 each	-	80	25I	125

\* Assessment as per pro-forma III

**Rationale:**

Often on big projects, Engineers from all discipline have to work in coalition. Some basic knowledge of Mechanical and Civil Engineering is essential for an engineer of the discipline other than that of him. Therefore this course is introduced as an allied course. It will help the students in getting acquainted with Civil & Mechanical engineering aspects.

**Competency:** Use the principles of mechanical and civil engineering in electrical engineering

**Cognitive:** Understand the basic principles of civil and mechanical engineering .

**Psychomotor:** Use mechanical and civil engineering devices for electrical engineering works.

**Affective:** Attitude of i) safety ii) accuracy iii) precision iv) aestheticism in works.

**Course outcomes:**

- EEF312-1. Use standard mechanical components such as shaft keys couplings, nut bolts , bearings etc.
- EEF312-2. Use power transmission and energy conversion devices
- EEF312-3. Handle pumps and compressors.
- EEF312-4. Assist in construction activities.
- EEF312-5. Carryout surveying and leveling activity .
- EEF312-6. Assist in works on irrigation and transportation systems .

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" : 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Become an entrepreneur with good technical skills.	3	—	2	1	2	—	1	2	3	3	2	2
EEF312-1. Use standard mechanical components such as shaft keys couplings, nut bolts, bearings etc.	3	—	3	1	3	—	1	2	3	3	2	2
EEF312-2. Use power transmission and energy conversion devices	3	—	2	1	2	—	1	1	3	3	—	—
EEF312-3. Handle pumps and compressors.	3	—	2	1	2	—	1	2	3	3	2	2
EEF312-4. Assist in construction activities.	2	—	2	1	2	—	1	2	3	3	2	2
EEF312-5. Carryout surveying and leveling activity	3	—	2	1	2	—	1	2	3	3	2	2
EEF312-6. Assist in works on irrigation and transportation systems	2	—	2	2	1	—	1	2	1	3	2	2

**Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>EEF312-1. Use standard mechanical components such as shaft keys couplings, nut bolts, bearings etc.</i>			
1	<b>Standard Mechanical Components</b> 1.1 Keys – Types of keys and their applications 1.2 Bolts and Nuts – Thread profiles for bolts & Nut, Different types of bolts & nuts, Fasteners etc. 1.3 Coupling – Muff, Flange, Flexible, Oldham's and Universal 1.4 Joint, Construction and working of all. <b>Shafts &amp; Bearings</b> 1.5 Types of shafts & Bearings 1.6 Selection of bearing. 1.7 Mounting of bearing.	10	14
<i>EEF312-2. Use power transmission and energy conversion devices</i>			
2	<b>Power Transmission Devices</b> 2.1 Belts, ropes, chains – Types, Material, Velocity ratio. 2.2 Gears & Gears trains – Classification and Types of gears – Spur, Helical, Bevel & worm. Gear terminology. <b>Energy conversion devices</b> 2.3 Classification, Main components and their functions 2.4 Working principles of Boilers, steam turbines, gas turbines, 2.5 Hydraulic turbines and I. C. Engines 2.6 Condensers and cooling towers – types, construction & working. 2.7 Sample specifications of above devices	16	20

<i>EEF312-3. Handle pumps and compressors.</i>			
3	<b>Pumps and Compressors</b> 3.1 Classification, Main components and their functions . 3.2 Working principle .of each type 3.3 Applications. 3.4 Sample specifications of above devices	06	06
		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 Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>EEF312-4. Assist in construction activities.</i>			
04	<b>Building Construction &amp; drawing:-</b> 4.1 Component parts of the building. 4.2 Stone Masonry and types. 4.3 Brick masonry and types of bonds. 4.3 Flooring and Types of Flooring. 4.4 Openings: doors and windows their types. 4.5 Circulation: Horizontal and vertical (passages and staircases) 4.6 Roofing and its types. 4.7 Pointing - Necessity 4.8 Plastering, necessity 4.9 Painting: 4.10 Plumbing work: water supply and sanitation. 4.11 Terms Related To Built Up Area: plinth area, carpet area, built-up area and FSI. 4.12 Introduction to building drawing.	09	10
	<b>Foundation and soil mechanics::</b> 4.13Types of soils and bearing capacities. 4.14 Types of foundations. ( definitions, brief description with diagrams) 4.15 Machine foundations - I.S. Recommendations	03	06
	<b>Concrete technology:</b> 4.16 Ingredients 4.17 Qualities and types of concrete. 4.18 Concreting procedure & centering works.	05	06
<i>EEF312-5. Carryout surveying and leveling activity .</i>			
05	<b>Engineering surveying:</b> 5.1 Surveying and leveling: definitions. 5.2 Types. 5.3 Instruments used for survey works (only uses): chains, tapes, prismatic compass, levels, theodolite, planimeter, total station.	06	06
<i>EEF312-6. Assist in works on irrigation and transportation systems .</i>			

06	<b>IRRIGATION &amp; TRANSPORTATION ENGINEERING.</b> <b>A) IRRIGATION ENGINEERING-</b> 6.1 Definition of irrigation, necessity of irrigation & its advantages 6.2 Type of Irrigation Projects - Major, Medium, And Minor. 6.3 Components parts of different types of irrigation projects. <b>B) WATER SUPPLY AND SANITARY ENGINEERING.</b> 6.4 Components of water treatment plant, components of waste water treatment plant,. <b>C) TRANSPORTATION ENGINEERING:</b> 6.6 Brief information about Roads, railways, bridges and tunnels.	09	12
	<b>TOTAL</b>	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**

Section / Topic No.	Name of topic	Distribution of marks (level wise)			Total Marks	Course Outcome
		Knowledge	Comprehension	Application		
I/1	Standard Mechanical Components	6		4	14	EEF312-01
I/2	Power Transmission Devices	4	4	2	20	EEF312-02
I/3	Pumps and Compressors	2	2	2	06	EEF312-03
II/4	Building Construction & drawing	4	4	2	22	EEF312-04
II/5	Engineering surveying	4	2	0	06	EEF312-05
II/6	Irrigation, & Transportation Engineering.	6	4	2	12	EEF312-06
	Total				80	

**Students will write the two sections in different answer books compulsorily.**

**Laboratory experiences and related skills developed.**

**Section I**

Sr. No	Laboratory experience	Course outcome
1	Study of Various Mechanical Components	EEF312-01
2	Study of Various Power Transmission Devices	EEF312-01
3	Study of energy conversion devices.	EEF312-02
3	Study of Bearings	EEF312-02
7	Demonstration on I.C. Engines	EEF312-03
8	Demonstration on pump and Compressor	EEF312-03

**Section II**

Sr.No.	Laboratory Experience	Course outcome
1	Demonstration of UTM.	EEF312-04
2	Demonstration of compression testing machine.	EEF312-04
3	Chain surveying	EEF312-05



4	Chain and compass surveying.	EEF312-05
5	Differential Leveling	EEF312-05
<b>Report on each of following visits</b>		
1	Visit to building for learning component parts.	EEF312-05
2	Visit to Minor Irrigation tank.	EEF312-06
3	Visit to water treatment plant	EEF312-06

Instructional Strategies:

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

Learning Resources :

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

REFERENCE BOOKS :-

**Reference Books:**

**Mechanical Engineering.**

- 1) Elements of Heat Engines - Vol. I & II - by Patel, Karamchandani
- 2) Hydraulic Machine - by R.S. Khurmi
- 3) Mechanical Technology - by R.S.Khurmi
- 4) Internal Combustion Engine- by Mathur, Sharma
- 5) Power plant Engineering- by Domkundwar.
- 6) Power plant Engineering- by Nagpal

**Civil Engineering:**

- 1) Basic Civil Engg By - G.K. Hiraskar
- 2) Basic Civil Engg By- Gole
- 3) Concrete Technology. - By Shetty and Shetty
- 4) Surveying and leveling : N. N. Basak
- 5) Irrigation Engineering: Dahigaonkar.
- 6) Environmental Engineering: Kamalkantha Rao.
- 5) Building Construction by 1) Rangwala 2) Sushilkumar

**(Level IV  
Applied Technology Courses)**

Course ID :

**Course Name : Electrical Estimation & Contracting.**

**Course Code : EEF401**

**Course Abbreviation : FEEC**

Pre-requisite Course(s) : Nil.

Teaching and evaluation scheme :

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

Evaluation Scheme :

Mode of Evaluation	Progressive Assessment		Theory Examination	Term End Exam		Total
	Theory	Practical		Term Work	Oral Examination (External)	
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 Theory Exam (03 hours)	As per Proforma-IV	As per Proforma-V	
Marks	20	--	80	25	25(E)	150

Rationale :

Diploma Electrical Engineers need to be well conversant in the field of maintaining electrical supply systems in Domestic, Commercial & Industrial units. This field is an ever changing one with new advancements coming up. This course will enable them to carry out the different activities such as contracting & executing the works needed for the same.

Competency: Install & Maintain Electrification Systems used in Domestic, Commercial & Industrial units .

Cognitive : Understand the different activities to be carried out for electrical installation.

Psychomotor : Prepare estimates for & Execute electrification work.

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

#### Course outcomes :

EEF 401 -1 Apply the rules of electrical estimation.

EEF401 -2 Prepare electrical Installation system Estimate for Residential Building.

EEF401 -3 Prepare electrical Installation system Estimate for Commercial Building.

EEF401 -4 Prepare electrical Installation system Estimate for small scale industry.

EEF401 -5 Carry out testing of electrical wiring Installation.

EEF 401-6 Prepare valid contract & tender documents for execution of electrical installation works.

**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	PSO1 Electrical equipment	PSO2 Electrical power systems
Install & Maintain Electrification Systems used in Domestic, Commercial & Industrial units	3	3	3	2	3	—	2	3	2	2	3	3
EEF 401 -1 Apply the rules of Electrical estimation	3	3	3	3	2	—	3	3	2	2	2	2
EEF401 -2 Prepare Electrical Installation system Estimate for Residential Building	3	3	3	3	2	—	3	3	3	2	3	2
EEF401 -3 Prepare Electrical Installation system Estimate for Commercial Building	3	3	3	3	2	—	2	3	2	2	3	3
EEF401 -4 Prepare Electrical Installation system Estimate for small scale industry	3	3	2	2	3	—	2	3	2	2	2	3
EEF401 -5 Carry out testing Of Electrical wiring Installation	3	3	2	3	3	—	2	3	2	2	3	2
EEF401-6 Prepare valid contract & tender documents for execution of electrical installation works	3	2	3	3	2	—	2	3	3	2	2	3

**Content :****A] Theory :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEF401-1 Apply the rules of Electrical estimation.			
1	Elements Of Estimating 1.1 IE Rules: IE rules related to electrical wiring installation work & Safety practices 1.2 Purpose of Estimation & Costing 1.3 Qualities of good Estimator 1.4 Essential Elements of Estimating & costing 1.5 Other important factors of estimating & costing 1.6 Drawing: pipe diagram, wiring diagram, key diagram, cable diagram 1.7 Length per point, Measurement of point wiring 1.8 Sequence to be followed in carrying out the estimate 1.9 positioning of Equipment	04	08
EEF401-2 Prepare Electrical Installation system Estimate for Residential Building			
2.	Residential Building Electrification 2.1 Rules & guidelines for wiring of Residential Installation and positioning of equipments. 2.2 Principles & procedures of circuit design in lighting and power circuits. 2.3 single line diagram.	10	16

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	2.4 Selection of type of wiring and rating of wires & cables. 2.5 Load calculations and selection of conductors. 2.6 Selection of main switch, ELCB ,MCB ,distributions board and wiring accessories. 2.7 Earthing 2.8 Sequence to be followed for preparing Estimate 2.9 Preparation of detailed estimates and costing		
<b>EEF401-3 Prepare Electrical Installation system Estimate for Commercial Building</b>			
3	Electrification of commercial Installation 3.1 Fundamental considerations for planning of an electrical Installation system for commercial building. 3.2 Design considerations of electrical Installation system. public building : school, bank, office ,auditorium ,library hall, Shopping mall, cinema theatre 3.2.1 Load calculations & selection of size of service connection and nature of supply. 3.2.2 Deciding the cables, bus bar and bus bar chambers. 3.2.3 Mounting arrangements and positioning of switchboards, distribution boards main switch etc. 3.2.4 Earthing 3.3 Selection of wires, wiring system & preparing layout. 3.4 Sequence to be followed to prepare estimate. 3.5 Preparation of detailed estimate and costing	10	16
	<b>Total</b>	<b>24</b>	<b>40</b>

**Section II**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<b>EEF401 -4 Prepare Electrical Installation system Estimate for small scale industry</b>			
4	Electrification of small scale industry unit 4.1 Guidelines for power wiring and motor wiring. single line diagram. 4.2 Design consideration of Electrical Installation in small Industry/Factory/workshop such as rice mill , Saw mill, flour mill , small scale unit containing Lathes & other machines. 4.2.1 Motor /load current calculations. 4.2.2. Selection and rating of wire, cable size & conduit. 4.2.3 main switch, MCB , fuse, starter, distribution boards etc. 4.2.4. Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. 4.3 Sequence to be followed to prepare estimate. 4.5 Preparations of detailed estimate and costing.	10	20
<b>EEF401-5 Carry out testing Of Electrical wiring Installation</b>			
5	Testing of Installation 5.1 IE rules & procedures 5.2 Testing of wiring Installation for verification of	08	10

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	current; Earthing, insulation resistance and continuity as per IS		
EEF401-5 Prepare valid contract & tender documents for execution of electrical installation works			
06	Contracting , Tendering 6.1. Types of contracts, contractors. 6.2 Valid Contracts, Contract documents. 6.3 Tender and tender notices. 6.4 Procedure for submission and opening tenders. 6.5 Comparative statements, criteria for selecting contractors, General conditions in order form. 6.6 Principles of Execution of works 6.7 Administrative approval, Technical sanctions. 6.8 Billing of executed work. 6.9 E-tendering: Need, Procedure, Advantage & Disadvantage	06	10
	Total	24	40

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	Elements Of Estimating	02	02	04	EEF401-1	08
2	Residential Building Electrification	02	04	10	EEF401-2	16
3	Electrification of commercial Installation	02	04	10	EEF401-3	16
4	Electrification of small scale industry unit	02	04	14	EEF401-4	20
5	Testing of Installation	02	02	06	EEF401-5	10
6	Contracting , Tendering	02	04	04	EEF401-6	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.

## B] TERM WORK

Assignments:

1. Electrical Installation scheme for single flat, independent bungalow and small house.  
Draw wiring diagram and prepare detailed estimate and its costing
  2. Electrical Installation scheme for commercial buildings. Draw wiring diagram and prepare detailed estimate and its costing.
  3. Electrical Installation scheme for small factory unit. Draw single line layout and prepare detailed estimate and its costing
- 1) Small factory unit 2) Workshop 3) Agriculture pump and floor mills etc.

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 Electrical Estimation & Costing* developed by the Institute in practical sessions of batches of about 22 students :

Assignments: Note: Use half imperial drawing sheets

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
01	Design electrical Installation scheme for a flat scheme/ Independent bungalow/House. Draw detail wiring diagrams also prepare material schedule and detailed estimate and costing. Prepare report and Drawing sheets. (Minimum 2 Drawing sheets).	<ol style="list-style-type: none"> <li>1. Draw the plan of a house</li> <li>2. Draw the the layout of wiring</li> <li>3. Mark the positions of main boards and sub boards and all points</li> <li>4. Draw the wiring diagram</li> <li>5. Calculate the length of wire</li> <li>6. Make the estimation</li> <li>7. Carry out economical cost by market survey</li> </ol>	EEF401-2
02	Design electrical Installation scheme for any one commercial complex having minimum 20KW load requirements. Draw detailed wiring diagram; prepare material schedule and detailed estimate and costing, prepare report and Drawing sheet (one Drawing sheet).	<ol style="list-style-type: none"> <li>1. Draw the plan of a commercial building.</li> <li>2. Draw the the layout of wiring</li> <li>3. Mark the positions of main boards and sub boards and all points</li> <li>4. Draw the wiring diagram</li> <li>5. Calculate the length of wire</li> <li>6. Make the estimation</li> <li>7. Carry out economical cost by market survey</li> </ol>	EEF401-3
03	Design Electrical Installation scheme for agriculture pump/flour mill. Draw wiring diagram, prepare material schedule and detailed estimate and costing. Prepare report and Drawing sheet. (One Drawing sheet).	<ol style="list-style-type: none"> <li>1. Draw the plan of a commercial building.</li> <li>2. Draw the the layout of wiring</li> <li>3. Mark the positions of main boards and sub boards and all points</li> <li>4. Draw the wiring diagram</li> <li>5. Calculate the length of wire</li> <li>6. Make the estimation</li> <li>7. Carry out economical cost by market survey</li> </ol>	EEF401-4
04	Design electrical Installation scheme for any two-factory/small unit/workshop having aggregate load of 30 KW. Draw wiring diagrams prepare material schedule & detail estimate and costing. Prepare report and Drawing sheet. (Two Drawing sheet).	<ol style="list-style-type: none"> <li>1. Calculate the total electrical load of industrial premises</li> <li>2. Decide the position of main panel board and sub board near to each machine.</li> <li>3. Calculate the length of main Cable</li> <li>4. Make the estimation</li> <li>5. Carry out economical cost by market survey</li> </ol>	EEF401-4
05	Prepare a test report after testing an electrical installation system.	Testing procedures for installation as per IS	
06	Prepare a tender notice for electrical works.	Prepare work specifications and relevant documents	EEF401-6

Industrial Visits to field works (3 Visits)

Assessment Criteria for Term work :

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

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

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05

	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
TOTAL		25

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted as per criteria given in *Laboratory Manual for Electrical Estimation & Costing*.

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

**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

**Books / Journals / IS Codes**

Sr. No.	Author	Title	Publisher
1.	K.B. Raina S.K.Bhattacharya	Electrical Design; Estimating and costing	New Age International (p) Limited, New Delhi
2.	Surjit Singh	Electrical Estimating and costing	Dhanpat Rai and company, New Delhi
3	B.D.Arora	Electrical wiring, Estimating and costing	R.B. Publication, New Delhi
3.	N. Alagappan S. Ekambaram	Electrical Estimating and costing	Tata Mc Graw Hill Publication, New Delhi
4.	S.L. Uappal	Electrical wiring Estimating and costing	Khanna Publication

2. ISO, IS, BS standards, Data Sheets, IE Rules Handbook

IS/International code: IS5909, 7733, 2174, 732, 4648

Websites:

<http://www.bestestimatepro.com/>

[bieap.gov.in/estimatingandcosting.pdf](http://bieap.gov.in/estimatingandcosting.pdf)

[http://indiacatalog.com/web\\_directory/electrical/electrical.html](http://indiacatalog.com/web_directory/electrical/electrical.html)



**Course ID :****Course Name : A.C. Rotating Machines****Course Code : EE402****Course Abbreviation : FACM****Pre-requisites : EE302****Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	03	06
Practical	02	
Tutorial	01	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i) 25 marks for continuous assessment ii) One PST of 25 marks	Term End Theory Exam (03 hours)	-	As per Performa-I	
Marks	20	-	80		25E	125

**Rationale:**

Induction motors are widely used in various industries as drive motors for variety of machines. Due to its rugged construction, smoother & efficient operation, it has replaced dc motors in variety of applications. Its introduction is a cause to give preference to AC system than DC system in most of the applications. With the advent of power electronic controllers (drives) it has become possible to use induction motors with these drives for almost all applications. All these applications can be studied and understood only if the induction motor & its working principle are well understood with a little bit of sound mathematical base. Since technicians are expected to maintain industrial systems involving induction motor as drive, it is highly essential to provide them necessary knowledge about construction, operation & testing of induction motor with sound mathematical background.

This course aims at strategic development of students so that they can understand, operate, use & test the induction motor as per the requirement

Course Competency: Use relevant single phase & three phase machines for different electrical engineering applications.

**Course Outcomes:**

- EEE402.1. Select the relevant three phase induction motor..
- EEE402.2. Determine the performance parameters using circle diagram.
- EEE402.3. Connect & use the proper device for starting & control of three phase induction motor.
- EEE402.4. Select & use the relevant three phase alternator.
- EEE402.5. Select & Use the relevant synchronous motor in different application.
- EEE402.6. Select & Use the relevant of single phase induction motor in different application.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix.**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Use relevant single phase & three phase machines for different electrical engineering applications	3	3	3	2	1	—	1	2	2	3	3	3
EEE402-1 Select the relevant three phase induction motor	2	2	3	1	3	—	1	1	2	3	1	1
EEE402-2 Determine the performance parameters using circle diagram	3	2	2	1	2	—	2	1	2	2	1	1
EEE402-3: Connect & use the proper device for starting & control of three phase induction motor	3	2	2	1	2	—	1	2	2	2	2	2
EEE402-4: Select & use the relevant three phase alternator.	2	2	2	1	2	—	1	2	2	2	2	1
EEE402-5: Select & Use the relevant synchronous motor in different application.	3	3	2	1	2	—	2	2	2	2	1	1
EEE402-6: Select & Use the relevant of single phase induction motor in different application	2	2	1	2	1	—	2	2	2	1	1	1

**Contents:****A) Theory****Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
EEF402-1: Select the relevant three phase induction motor.			
1	Performance of 3 phase induction motor 1.1 Types of induction motor – Single phase & Three Phase 1.2 Construction of 3 phase induction motor ( Stator & Rotor ) Squirrel cage induction motor & Slip ring induction motor 1.3 Various parts of 3 phase induction motor 1.4 Working principle of 3 phase induction motor 1.5 Production of rotating magnetic field by 3 phase supply in 3 ph winding. 1.6 Concept of Synchronous speed , actual speed & slip . 1.7 Concept of rotor frequency, rotor induce emf & power factor at starting & running condition.	10	16

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Evaluation Marks
	1.8 Concept of starting torque, full load torque and maximum torque and relation between them. 1.9 Ratio of full load torque to maximum torque, full load torque to starting torque and starting torque to maximum torque. 1.10 Condition for maximum torque under starting and running conditions. 1.11 Characteristics of slip torque of 3 phase induction motor. 1.12 Concept of rotor frequency, rotor induce emf & power factor at starting & running condition. 1.13 Power flow diagram of an induction motor ( numerical) 1.14 Equivalent circuit of an induction motor 1.15 Induction motor as a generalized transformer ( phasor diagram)		
EEF402-2: Determine the performance parameters using circle diagram.			
2	Circle Diagram 2.1 No load test & blocked rotor test 2.2 Concept of circle diagram 2.3 Construction of circle diagram 2.4 Numerical on circle diagram –to find current, power factor ,rotor copper loss, rotor input, stator input, rotor efficiency ,motor efficiency at a) Full load condition. b) Maximum output condition c) Maximum torque condition. d) Maximum Input condition.	08	12
EEF402-3: Connect & use the proper device for starting & control of three phase induction motor.			
3	Starting & Speed control of 3 phase induction motor 3.1 Necessity of starter 3.2 Types of starter a) D.O.L Starter b) Stator resistance Starter c) Auto transformer starter d) Star delta starter e) Rotor resistance Starter f) Soft starters. 3.3 Methods of speed control from a) Stator side – By changing supply voltage ,supply frequency & no. of poles. b) Rotor side – By changing rotor resistance, injection of emf in rotor circuit and cascade operation. 3.4 Applications of 3 phase induction motor a) Squirrel cage induction motor b) Slip ring induction motor	06	12
		24	40

**Section –II**

Sr. no.	Topics/Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF402-4: Select & use the relevant three phase alternator.			
4	Three- Phase A.C. Generator or Alternator 4.1 Constructional details of 3 Phase Alternator 4.2 Advantages of stationary Armature 4.3 Types of alternator according to the rotor construction 4.4 Use of damper winding 4.5 Types of winding Single layer winding & Double layer winding 4.6 E.M.F. equation of an Alternator with numericals by considering short pitch factor & distribution factor 4.7 Alternator on load Factors affecting the terminal voltage of alternator a) Armature resistive drop b) Leakage reactance drop c) Armature reaction at various power factor & concept of synchronous impedance 4.8 Regulation of 3 phase Alternator by a) Direct loading method b) synchronous impedance method- (O.C. & S.C. Tests)	08	16
EEF402-5: Select & Use the relevant synchronous motor in different application.			
5	Synchronous Motor 5.1 Principle of working /operation. 5.2 Concept of load angle. 5.3 Synchronous motor on load with constant excitation. (Numerical). 5.4 Effect of excitation at constant load. (Numerical). 5.5 V-Curves and Inverted V-Curves. 5.6 Hunting and Phase swinging. 5.7 Methods of Starting of Synchronous Motor. 5.8 Applications. 5.9 Comparison between Induction motor and Synchronous Motor.	08	12
EEF402-6: Select & Use the relevant of single phase induction motor in different application.			
6	Single Phase Induction Motor 6.1 Double field revolving theory. 6.2 Types of single phase Induction motor. 6.3 Study of following motor w.r.t. Construction, working principle, torque-speed characteristic and applications. a) Resistance start induction run. b) Capacitor start induction run. c) Capacitor start capacitor run. d) Shaded pole I.M. e) Repulsion I.M. f) A.C. Series motor. g) Universal motor . h) Hysteresis motor. i) Repulsion motor.	08	12
		24	40

## A:- Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks Cognitive based (level wise)			Total marks	Course outcome
		Remember	Under-standing	Application		
I / 1	Performance of 3 phase I.M. motor	6	4	6	16	EEF402-01
I / 2	Circle Diagram	-	4	8	12	EEF402-02
I / 3	Starting & Speed control of 3 ph I.M	8	4	4	12	EEF402-03
II / 4	3- Phase A.C.Generator / Alternator	4	4	8	16	EEF402-04
II / 5	Synchronous Motor	4	4	4	12	EEF402-05
II / 6	Single Phase Induction Motor	4	4	4	12	EEF402-06

## B] Term works:

Sr. no	Laboratory experiences	Course outcome
1	Study of Constructional details of 3- $\phi$ induction motors..	EEF402-01
2	To reverse the direction of rotation of 3- $\phi$ induction motor.	EEF402-01
3	Perform Direct loading test on given 3- $\phi$ Slip-ring induction motor.	EEF402-02
4	Conduct No-load test and Blocked-rotor test on given 3- $\phi$ squirrel cage induction motor and plot the Circle diagram.	EEF402-03
5	Study of DOL starter, Star-delta starter, rotor resistance starter.	EEF402-04
6	Speed control of 3- $\phi$ squirrel cage induction motor by Pole changing method.	EEF402-04
7	To find regulation and efficiency of an alternator by direct loading.	EEF402-05
8	Determination of regulation and efficiency of an alternator from OC and SC tests (Synchronous impedance method )	EEF402-05
9	To draw 'V' curves and inverted 'V' curves on No-load of 3- $\phi$ synchronous motor.	EEF402-06
10	Study of constructional details of 1- $\phi$ induction motors.	EEF402-06

C :-Industrial Exposure :-Industrial visits

D:- 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
	Total	50

E:-Instructional strategies:

Instructional Methods

- 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.

F:- Reference Books:

- a)1.Electrical Technology (by Edward Hughes).
- 2.Electrical Technology (by H. Cotton).
- 3.Basic Electrical Engineering (by V. N. Mittal)
- 4.Electrical technology (vol. II AC & DC Machines) (by B. L. Theraja).
- 5.Fundamentals of Electrical Engineering (V. K. Mehta).
- 6.Electrical Machines (by Dr. S. K. Bhattacharya)

b)Websites

www.google.com  
www.wikipedia.com  
www.electrical 4 u.com

**Course ID****Course Name : Switchgear & Protection****Course Code : EE403****Course Abbreviation : FSWP****Pre-requisite Course(s) : EE302****Teaching and evaluation scheme:****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	06
Practical	02	
Tutorial	01	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral/practical 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)		Oral As per Proforma-I	
Marks	20	--	80	-	25 E	125

**Rationale :**

The electrical supervisor/technician has to look after day to day operation, control and maintenance of switchgear used in various electrical systems for trouble free working. He should be conversant with the various technical aspects of switchgears such as principle, construction, working and performance.

Electrical Protection is necessary for every electrical equipment as no part of the electrical system is left unprotected. A technician supervisor has to make a judicious choice of adequate protection by considering several technical aspects. Thus in order to arm the supervisor with skills to maintain normal working of electrical system the various aspects of electrical protection should be known along with the skills required for the same. This course imbibes the relevant skills needed and also to develop the lifelong learning skills for the same.

**Competency**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- Implement electric switchgear and protection schemes in power systems.

**Cognitive:** Understand the working along with construction the various switchgear and protection systems in electric systems.

**Psychomotor :** Work on switchgear and protection systems while interpreting drawings and signals.

**Affective :** Develop the attitudes of i) safety ii) accuracy iii) precision and iv) aestheticism.

**Course outcomes:**

- EEF403.1. Maintain and operate different components in substations.  
 EEF403.2. Use relevant relays for different applications in power systems.  
 EEF403.3. Use relevant circuit breaking devices in electrical power systems.  
 EEF403.4. Carry out overvoltage protection related activities in electric power systems.  
 EEF403.5. Implement protection schemes for alternators and transformers.  
 EEF403.6. Implement protection schemes for busbars and transmission/distribution lines.

**Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Implement electric switchgear and protection schemes in power systems	2	3	3	3	1	—	—	2	2	3	3	3
EEE406-1: Maintain and operate different components in substations.	2	3	3	3	1	—	—	3	2	3	3	3
EEE406-2: Use relevant relays for different applications in power systems.	2	3	3	3	1	—	—	2	2	3	3	3
EEE406-3: Use relevant circuit breaking devices in electrical power systems.	2	3	3	3	2	—	—	2	2	3	3	3
EEE406-4: Carry out overvoltage protection related activities in electric power systems.	2	3	3	3	2	—	—	2	2	3	3	3
EEE406-5: Implement protection schemes for alternators and transformers.	2	3	2	3	1	—	—	2	2	3	3	3
EEE406.6: Implement protection schemes for bus bars and transmission lines.	2	3	3	3	2	—	—	2	2	3	3	3



Contents :

B) Theory :

Section – I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>CO: EE403-1: Maintain and operate different components in substations.</i>			
1	Electrical Substations: Types of sub-stations, indoor and outdoor substations. Single line diagram of transmission substations. Equipment in substations, Bus bar arrangements. Use of current limiting reactors & their arrangements. Substation Earthing.	06	08
<i>CO: EE403-2: Use relevant relays for different applications in power systems.</i>			
2	Protective Relaying: Components of relaying: CT, PT, Summation transformer, Requirements of relaying, Relay terminology, essential qualities of protection, types of electromagnetic relays, static and microprocessor based relays. Relay Applications and characteristics: Over current relays, Time-current characteristics, Current setting, time setting, static over current relay, reverse power or directional relays, Differential relay, translay relay, distance relays, amplitude and phase comparators, duality between amplitude & phase comparators.	08	20
<i>CO: EE403-3: Use relevant circuit breaking devices in electrical power systems.</i>			
3	Circuit operating devices: Necessity and functions of protective system, normal and abnormal conditions, types of faults & their causes. Fuses – Construction, Working of semi closed & HRC fuse Expulsion, dropout fuse ,characteristics , selection and applications . Arc formation process ,Methods of arc extinction – High resistance method , Low resistance or current zero Method, Related terms – Arc voltage, Recovery voltage & Restriking voltage , RRRV. Circuit Breakers: Construction, specification & application of H.T. MOCB, sulfur-hexafluoride circuit breaker(SF6), vacuum circuit Breaker, L.T – Air circuit Breaker( ACB) Auto reclosing, single phase and three-phase isolators.	10	12
		24	40

## Section II

<i>CO: EEF403-4: Carry out overvoltage protection related activities in electric power systems.</i>			
4	Over Voltage Protection:- Causes of over voltages, Protection of transmission line & substation from direct strokes. Lightning arresters: construction & principle of operation Rod gap, horn gap, Zno type , expulsion and thyrite type. Surge absorber: working with neat diagram. Protection against traveling waves Insulation co-ordination.	08	12
<i>CO: EEF403-5: Implement protection schemes for alternators and transformers.</i>			
5	Protection of Alternators Abnormalities & faults, differential, over current, earth fault, inter-turn fault, negative phase sequence, over heating and reverse power protections. Protection of Transformer Abnormalities & faults, differential, over-current, earth fault, inter-turn fault, restricted earth fault and over heating protections and buchholz protection.	10	16
<i>CO: EEF403-6: Implement protection schemes for busbars and transmission/distribution lines.</i>			
6	Protection of Bus bar and Transmission lines: Abnormalities and faults, bus-bar protection, feeder protection, time graded/current graded over current protections, differential pilot wire protection, distance protection.	06	12
		24	40

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
		Knowledge	Comprehension	Application		
I / 1	Electrical Substations	02	02	04	EEF403-1	08
I / 2	Protective Relaying	04	04	12	EEF403-2	20
I / 3	Circuit operating devices	02	04	06	EEF403-3	12
I / 4	Over Voltage Protection	02	04	06	EEF403-4	12
I / 5	Protection of alternators and transformers	02	04	10	EEF403-5	16
II / 6	Protection of Bus bar and Transmission lines	02	04	06	EEF403-6	12

## B . Term work

Observe operation and prepare six drawing sheets (one for each CO) from following list.

Sr. no.	Drawing Sheets	Skills developed	CO
1	Fuse and their Types	Use various types of fuses.	EEF403-3
2	Circuit Breakers	Recommend and use various types of CBs.	EEF403-3

Sr. no.	Drawing Sheets	Skills developed	CO
3	Lightning Arresters	To identify basic components of various types of L.A	EEF403-4
4	Layout of Outdoor substation	Prepare layout of an outdoor substation.	EEF403-1
5	Relays	Recommend and use different types of relays.	EEF403-2
6	Protection schemes for Alternator.	Develop protection schemes for alternators.	EEF403-5
7	Protection schemes for Transformers.	Develop protection schemes for transformers.	EEF403-5
8	Protection schemes for Feeders / Transmission Lines.	Develop protection schemes for feeders / transmission Lines.	EEF403-6

## C) Industrial exposure :

SN	Mode of Exposure	Topic
1.	Visit to outdoor substation	All components
2.	Visit to LT Switchgear manufacturing Unit	All components

## Instructional strategies:

- 1) Lectures and discussions.
- 2) Industrial visits.
- 3) Time bound assignments.

## Teaching and Learning resources, including references:

- 1)Chalk-board.
- 2)Demonstrative kits.
- 3)Demonstrative charts.

## 4)Books:

1. Power System Protection & Switchgear: - B. Ravindranath & M. Chandar
2. Switchgear & Protection: - Sunil S. Rao
3. A Course in Electrical Power: - M. L. Soni, P.V. Gupta, Bhatanagar
4. Art & Science of Protective Relaying: - C R Mason.
5. Principles of Power Systems: - V. K. Mehta.

**Course ID :**

Course Name : **Electrical Power Utilization and Traction.**  
 Course code : **EEF 404.**  
 Course abbreviation : **FEUT.**  
 Course pre requisite : **None.**

**Teaching and Evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	06
Practical	02	
Tutorial	01	

**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:**

The Diploma electrical supervisor / technician is expected to maintain various heavy electric equipment in heating, welding, electric traction and drives systems. Their main job functions are to supervise the operation & control of various electrical drives, electrical furnaces, and electric welding equipments. In the present days of energy crisis, understanding this economics is important, not only for technician himself but also for social awareness. Hence he/ she should get acquainted with maintenance of such systems. This course deals with above job functions preparing the technicians to handle such heavy equipment systems.

Course Competency : Maintain heavy electrical power utilization systems.

Cognitive : Understand the working of Electrical Power Utilization and Traction systems.

Psychomotor : Operate and maintain heavy electrical equipments.

Affective : Development of attitude of i) safety ii) accuracy iii) punctuality towards work.

**Course outcomes :**

EEF 404- 1 To maintain components of substation, feeding post of supply systems to OHE.

EEF 404- 2 To operate and maintain power, auxiliary and train lighting electric circuits in electrical traction.

EEF 404- 3 Carryout maintenance of electric locomotive using standard procedures.

EEF 404- 4 Maintain electric welding equipment.

EEF 404- 5 Select use electric drives.

EEF 404- 6 Maintain electrical heating system like oven and furnaces.

**Competency, course outcomes and programme outcomes/programme****Specific outcomes (cp-co-po/pso) matrix.**

[ Note : Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

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	PSO1 Electrical Equipment	PSO2 Electrical Power systems
Competency Interpret electrical layouts, designs, and to maintain the electrical system.	3	3	3	2	2	—	—	1	2	1	3	3
<b>EEF 404- 1</b> To maintain components of substation, feeding post of supply systems to OHE	3	3	2	2	2	—	—	1	1	2	2	2
<b>EEF 404- 2</b> To operate and maintain power, auxiliary and train lighting electric circuits in electrical traction.	3	3	3	3	2	—	—	1	1	2	2	2
<b>EEF 404- 3</b> Carryout maintenance of electric locomotive using standard procedures.	2	3	3	1	1	—	—	1	1	2	3	3
<b>EEF 404- 4</b> Maintain electric welding equipment.	3	3	2	2	3	—	—	1	1	2	2	3
<b>EEF 404- 5</b> Select and use electric drives.	3	3	2	1	3	—	—	1	1	2	2	2
<b>EEF 404- 6</b> Maintain electrical heating system like oven and furnaces.	2	2	1	1	2	—	—	1	1	2	2	2

## A] Course content :

## Section I

Sr. no.	Topics / subtopics	Teaching (Hours)	Theory Marks
<b>EEE 404 -1: To maintain components of substation, feeding post of supply systems to OHE.</b>			
1	<b>Traction System :</b> .1. AC and DC electrical traction systems. .2. High voltage supply system for traction, substations, Feeding Posts, Feeding and sectioning arrangements, sectioning and paralleling post, sub sectioning post. .3. Elementary sections. Miscellaneous equipments at control post or switching stations. .4. Major equipments at substations.- Transformer, circuit breakers, interrupter, Protective system for AC traction-Transformer protection and 25 kv catenary protection. .5. Traction motors, types and their characteristics suitable for traction. .6. Comparison of AC and DC electrical traction systems.	06	08
<b>EEE 404 -2: Operate and maintain OHE components in electrical traction.</b>			
2	<b>Over head equipments :</b> 2. 1 Over head equipments (OHE) 2. 2 Composition of OHE, Height, and Gradient of contact wire Encumbrance, Span length. Effect of speed on OHE.	08	16

	2.3 Automatic weight tension and temperature compensation. 2.4 Uninsulated and Insulated Overlaps 2.5 Neutral sections, section insulators 2.6 Polygonal OHE :- Catenary constructions. 2.7 System of supplying power in electric traction:- third rail or conductor rail system, Trolley collector or pole collector, Bow collector, 2.8 Operation of Pantographs: Diamond, and Faiveley Type. 2.9 Maintenance of OHE and pantograph.		
<i>EEE 404 -3: Carryout maintenance of electric locomotive using standard procedures.</i>			
3.	Electric Locomotive: 3.1 Power Circuit Equipments : Pantograph, Circuit breaker, Tap-changer, Traction Transformer, Rectifier, Smoothing Choke, Traction Motor. 3.2 Auxiliary Circuit Equipments: Head Light, Flasher Light, Horn, Marker Light, Arno Converter, Blowers, Exhausters, Compressors, Selsyn Transformer. Contactors and Relays used for electric locomotive. 3.3 Train lighting: System and Requirement of train lighting, Obtaining Unidirectional Polarity , Constant output, obtaining Single battery output, Double battery Parallel Block System. 3.4 Three Phase Locomotive: Three phase power supply arrangement for Traction motor and auxiliary Machines in Three Phase Locomotive. 3.5 Locomotive Maintenance: Need of Maintenance, Reliability and Availability of Locomotive, Training Facility and Characteristics of Efficient Maintenance. Electrical Faults and Their Causes.	10	16
	<b>TOTAL</b>	24	40

## Section –II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>EEE 404-4 : Maintain electric welding equipment.</i>			
4	<b>ELECTRIC WELDING:</b> 4.1 Resistance welding and equipments. 4.2 Electric Arc welding : Types and equipments. 4.3 Comparison of AC & DC welding 4.4 Comparison of metal arc & carbon arc welding.	06	08
<i>EEE 404-5 : Select and use electric drives.</i>			
5	<b>ELECTRIC DRIVES :</b> 5.1 Classification of electric drives 5.2 Factors governing selection of electric drives 5.3 Electrical characteristics 5.4 Mechanical features and cost	08	16

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	5.5 Size & rating of motors- Duty cycle (Numericals) 5.6 Motors for particular applications, Load equalization 5.7 Comparison between A.C. and D.C. Drives. 5.8 Advantages of electric drives.		
<i>EEE 404-6 : Maintain electrical heating system like oven and furnaces.</i>			
6	ELECTRIC HEATING 6.1 Modes of heat transfer. 6.2 Methods of electric heating. 6.3 Resistance heating, Resistance Ovens. 6.4 Requirements of heating element & heating materials 6.5 Radiant & infrared heating 6.6 Induction heating- 6.8.1 Core and coreless type induction heating 6.8.2 Ajax-Wyatt vertical core type furnace 6.8.3 Indirect induction furnace 6.8.4 High frequency eddy current heating 6.7 Dielectric heating 6.8 Heating by electric arc, Electric Arc furnace 6.9 Specifications of Furnace	10	16
	TOTAL	24	40

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

Section / Topic No	Name Of Topic	Distribution of Marks (level wise)			Course outcome	Total Marks
		Remember	Understand	Application		
I / 1.	Traction Systems	2	4	2	EEF404-1	08
I / 2	Over head equipments	4	8	4	EEF404-2	16
I / 3	Electric Locomotives	4	8	4	EEF404-3	16
II / 4	Electric Welding	2	2	4	EEF404-4	08
II / 5	Electric Drives	4	6	8	EEF404-5	16
II / 6	Electric Heating	4	6	8	EEF404-6	16

**B] Term work: Laboratory Practice / Assignments/Drawing sheets/Group discussions**  
 (Minimum eight practical to be performed)

Sr. no	Assignments and drawing sheet	Skill to be developed	Course outcome
1	Comparative study of different systems of railway electrification viz. i) DC system, ii) Single phase AC system iii) Three phase system iv) Composite system	1] Understand various voltage levels in tractions. 2] Types of tractions. 3] To make choice of tractions.	EEF404-1

2	Study of various types of motors used for electric traction purpose.	1] Understand various motors used in tractions. 2] To make choice of motor for tractions.	EEF404-1
3	Torque / Current , Speed / Torque Characteristics of AC/DC motors.	1] Understand various AC- DC motors loading characteristics used in tractions.	EEF404-1
4	Study of current collection systems from overhead lines from traction. [Use websites]	1] Functions of current collection systems from overhead lines. 2] Various parts their off.	EEF404-2
5	Sketch of labeled electric traction power circuit and auxiliary circuit diagram and explain function of each component, specifications , tests associated, and applications. [Use websites]	1] Power and auxiliary circuit diagram. 2] Various components. 3] Functioning and applications of each components. 4] Test involved for components.	EEF404-3
6	Sketch of labeled and describe in brief their applications various electric welding machines. State comparative study considering advantages and disadvantages.	1] Functions of welding machines. 2] Various parts their off. 3] To make choice of motor for tractions. 4] Circuit diagram and connections.	EEF404-4
7	Sketch of labeled and describe in brief their applications various Resistance heating furnace, Arc furnaces. State comparative study considering advantages and disadvantages.	1] Functions of Resistance heating furnace, Arc furnaces. 2] Various parts their off. 3] To make choice of motor for tractions. 4] Circuit diagram and connections.	EEF404-5
8	Sketch of labeled and describe in brief their applications of various Dielectric heating furnace and Induction heating furnaces. State comparative study considering advantages and disadvantages.	1] Functions of Dielectric heating furnace and Induction heating furnaces . 2] Various parts their off. 3] To make choice of motor for tractions. 4] Circuit diagram and connections.	EEF404-6

**C] Industrial exposure :**(Included in *Laboratory Manual / File/ Assignment for Electrical Traction and utilization*)

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

**Criteria for Continuous Assessment of lab work and Progressive Skill Test:**

Sr. no	Criteria	Marks allotted
1	Attendance at regular lab.	5
2	Assignment preparation.	5
3	Correct figures / Diagrams/Labels.	5
4	Chart/ Model making/Group discussion.	5
5	Safety concepts and clarity of its ideas.	5
		25

**Instructional strategies:**



- 1) Lectures and discussions.
- 2) Laboratory interactive sessions [ Specifications, Testing procedures, Applications, Drawing sheet.]
- 3) Time bound assignments.
- 4) Group discussions : About operations of component their Specifications, Testing procedures, Applications etc.
- 5) Industrial visits. : Substation visit
- 6) Slides, Video films.

**Teaching and Learning resources, including references:**

- 1) Chalk-board.
- 2) Demonstrative kits.
- 3) Demonstrative charts.

**Text Books :**

- 1) A Course in Electrical power by Soni, Gupta and Bhatnagar.
  - 2) A Course in Electrical power by S.L. Uppal.
  - 3) Utilization of Electrical Energy by Suranarayana.
  - 4) Utilization of Electrical Energy by H Pratap
  - 5) Utilization of Electrical Energy by Openshaw Taylor.
  - 6) Modern Electric Traction by H Pratap.
-

**Course ID :**

Course Name : **Energy Conservation and Audit**  
 Course Code : **EEF405**  
 Course Abbreviation : **FECA**  
 Pre-requisites : **Nil**

**Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i. 50 marks for continuous assessment ii. One PST of 50 marks	Term End Theory Exam (03 hours)	As per Proforma III	--	
Marks	20	--	80	25	--	125

**Rationale:**

The pressure on the natural resources of energy such as water, coal, gas, wood and other fuels has lead to the increasing costs of energy around the world. Efficient and judicious use of the available energy would lead to the easing of such pressures and drastic decrease in the operating costs of the organizations and industries. Thus it is necessary to save and conserve energy to the maximum possible extent. The process of energy audit will help to identify the various possible avenues in which savings of energy can be effectively affected. This course makes the diploma holder well conversant in the techniques of energy conservation in the fields of engineering. It also introduces him to the energy audit procedures.

**Course Competency:** Use environment friendly energy conservation techniques and assist in energy audits.

**Course Outcomes:**

- EEF405-1 Identify present environmental effects and suggest use of Non Conventional Energy sources.
- EEF405-2 Use Co-generation Systems
- EEF405-3 Implement energy conservation techniques in electrical machines
- EEF405-4 Implement energy conservation techniques in electrical lighting systems
- EEF405-5 Implement energy conservation techniques in electrical power distribution system
- EEF405-6 Carry out simple energy audits.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Use environment friendly energy conservation techniques and assist in energy audits.	3	3	3	3	3	3	3	3	2	3	3	3
EEF405-1: Identify present environmental effects and suggest use of Non Conventional Energy sources	3	2	3	3	3	3	3	3	2	3	3	3
EEF405-2: Use cogeneration system	1	3	3	3	3	3	2	3	2	3	3	3
EEF405-3 : Implement energy conservation techniques in electrical machines	3	2	2	1	2	2	1	2	2	3	3	3
EEF405-4 Implement energy conservation techniques in lighting systems	3	3	2	3	2	3	3	3	2	3	3	3
EEF405-5 : Implement energy conservation techniques in electrical power distribution systems	2	3	3	3	3	3	3	3	3	3	3	3
EEF405- 6 carry simple energy audits.	2	3	3	3	3	3	3	3	3	3	3	3

**CONTENTS:****THEORY****Section I**

Sr. no.	Topics / sub-topics	Teaching (Hours)	Theory evaluation Marks
<i>EEF405-1 Identify present environmental effects and suggest use of Non Conventional Energy sources.</i>			
1	Present Energy Scenario and environment Review of various energy sources Classification of Energy: Primary and secondary energy, Commercial and non-commercial energy, Renewable and Non-renewable energy. Energy production and needs of growing economy like India, energy pricing in India, energy sector reforms, Salient features of Electricity Act 2003. Relation between Energy and Environment Issues of global environment Causes of Ozone layer depletion and its effects and measures to counter it. Global warming implications with special emphasis on green house effect, steps to reduce it.	08	12
<i>EEF405-2 Use Co-generation Systems</i>			
2	2.1 Thermal Energy and Co- Generation: Thermal energy of fuels, latent & sensible heat Evaporation, condensation, humidity, heat transfer.	08	16

Sr. no.	Topics / sub-topics	Teaching (Hours)	Theory evaluation Marks
	Need for Cogeneration Classification of cogeneration systems on the basis of the Sequence of energy use. Classification of cogeneration systems on the basis of the technologies. Steam turbine cogeneration, Advantages of cogeneration 2.2 Tariff:: Energy cost and recent MSEDCL tariff Applications of tariff system to reduce Energy bill Energy conservation by improving load factor and power factor Simple numerical		
<i>EEF405-3 Implement energy conservation techniques in electrical machines</i>			
3	Energy conservation in Electrical Machines and their controls Energy efficient transformers: amorphous core transformers, epoxy resin cast transformers, specialty of cores and windings of such transformers. Energy conservation techniques in electric motors : Power flow diagram of induction motor, improving power quality, matching motor and load, operating in star mode, rewinding, minimizing idle and redundant running of motors, soft starters, VFD and improving mechanical power transmission efficiency . Energy efficient motors (EEM): features	08	12
	Total	24	40

**Section II**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<i>EEF405-4 Implement energy conservation techniques in electrical lighting systems</i>			
4	Energy conservation in lighting system: Assessing existing lighting system, replacement of light sources, light control gears, motion detectors, separate transformer/ servo stabilizer for lighting ,regular survey and adequate maintenance programs, use of solid state devices such as microprocessors etc.	08	12
<i>EEF405-5 Implement energy conservation techniques in electrical power distribution system</i>			
5	Energy conservation in distribution systems Distribution losses at global, national and state level, commercial and technical losses. Energy conservation techniques Reducing line losses, compensating reactive power flow, optimizing distribution voltage , balancing phase currents and using energy efficient transformers . Reducing commercial losses.	08	14
<i>EEF405-6 Carry out simple energy audits</i>			
6	Energy audit Energy flow diagrams with significance, audit instruments, questionnaire and ABC analysis.	08	14

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	Walkthrough audit and detailed audit Calculations of simple payback period		
	Total	24	40

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	Present Energy Scenario and environment	2	4	6	EEF405-1	12
I/2	Thermal Energy and Co-Generation	4	4	8	EEF405-2	16
I/3	Energy conservation in Electrical Machines and their controls	2	4	6	EEF405-3	12
II/4	Energy conservation in lighting system	2	4	6	EEF405-4	12
II/5	Energy conservation in distribution systems	2	4	8	EEF405-5	14
II/6	Energy audit	2	4	8	EEF405-6	14

**TERMWORK**

Practicals / experiences and related skills developed.

Sr. no	Practical works	Skills/Information developed
1	Energy conservation building code 2007	Conservation in buildings
2	Conduct Energy survey	1) Identify the various types of energy consumptions 2) Classify them and mark out their percentages in an industry.
3	Data collection of consumers	Data collection of various consumers e.g. industries, commercials , agriculture and data analysis
4	Compare different types of lamps (input power and output)	Conduct practical to measure their input power and output light of various lamps
5	Co generation	1) Visit a plant of cogeneration e.g. sugar industries , spinning mills , Heat processing unit 2) Prepare report on the cogeneration containing energy flow diagrams , economics and tariffs structure
6	Environment issue	1) Collect data of pollution e.g. air, sound, water etc 2) Prepare report on it
7	Case study.	Case study of any type small industry which has implemented energy conservation and auditing techniques.

**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
	Total	50

**Instructional strategies:**

- 1) Lectures and discussions.
- 2) Industrial visit / survey, experiences and interactive sessions.
- 3) Time bound assignments.
- 4) Case studies.

**Books**

- a) Hand book by Bureau of Energy efficiency.
- b) India: The Energy Sector, P. H. Henderson, Oxford University press.
- c) Industrial Energy Conservation, D. A. Ray, Pergaman Press.
- d) Energy Management Handbook, W. C. Turner, Wiley Press.

**COURSE ID :**

Course Name : **Power Electronics**  
 Course Code : **EEF406**  
 Course Abbreviation : **FPET**  
 Pre-requisite Course(s) : **EEF309- FAET**

**TEACHING AND EVALUATION SCHEME :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Theory Examination	Term End Examination		Total
	Theory	Practical		Term Work	Practical Exam	
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-I	
Marks	20	25	80	---	25E	125

**E-External Assessment****\* Assessment as per Pro-forma I****RATIONALE :**

There is no field in modern industry where the contribution of electronics is not seen. Many electronic controls are used in industry. They have replaced manual and electromagnetic control systems. Therefore it is essential to study the important control devices in the field of Power Electronics.

**COMPETENCY :** Use the relevant electronic power circuit for industrial applications.

**Cognitive:** Understand the different electronic circuits used in industries.

**Psychomotor:** Use the relevant electronic circuits in industrial applications following safe practices.

**Affective:** Attitude of i) safety ii) accuracy iii) aestheticism in works.

**COURSE OUTCOMES :**

- EEF406-1. Use the controlled rectifier in relevant industrial circuit.
- EEF406-2. Use the inverter and chopper in relevant industrial circuit.
- EEF406-3 Use the relevant power supply in various electronic circuit applications.
- EEF406-4 Assist in maintaining NC/CNC machines.
- EEF406-5 Use relevant cyclo-converter in industrial circuits.
- EEF406-6 Implement suitable DC motor and AC motor speed control method per requirement.

**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 Electrical Equipment	PSO 2 Electrical power systems
Competency: : Use the relevant electronic power circuit for industrial applications.	2	2	2	2	1	—	1	1	1	3	3	3
EEF406-1	2	2	3	2	1	—	1	1	2	3	3	3
EEF406-2	3	2	2	2	1	—	2	1	2	2	3	3
EEF406-3	2	2	2	2	1	—	1	2	2	2	3	3
EEF406-4	3	3	2	2	1	—	2	2	2	2	2	1
EEF406-5	2	2	2	2	1	—	2	2	2	3	2	2
EEF406-6	2	2	2	2	1	—	1	2	1	3	3	3

**CONTENT :****C)THEORY :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>EEF406-1. Use the controlled rectifier in relevant industrial circuit.</i>			
1	Controlled Rectifiers 1.1 Principle of phase control 1.2 Single phase half wave converter 1.2.1 Single phase half wave converter with R-L load. 1.2.2 Single phase full converter 1.2.3 Single phase full converter with R-L load. 1.2.4 Single phase Bridge rectifier with R/R-L load 1.2.5 Single phase half controlled Bridge rectifier (Symmetrical, asymmetrical configuration) 1.3 Three phase half converters with R/R-L load. 1.4 Three phase full converters with R / R-L load. 1.5 Effect of source inductance. 1.6 Effect of free - wheeling diode.	10	14
<i>EEF406-2. Use the inverter and chopper in relevant industrial circuit.</i>			
2.	Inverters And Choppers 2.1 Classification of Inverters 2.2 Single phase capacitor commutated parallel inverter	11	18



Sr. No.	Topics / Sub-topics	Lecture s (Hours)	Theory Evaluation (Marks)
	2.3 Series inverter 2.4 Single phase bridge inverter - operation and output Waveform 2.5 Three phase bridge inverter operation and output Waveform 2.6 Classification of Choppers 2.7 DC choppers 2.8 Jone's chopper 2.9 Morgan's chopper 2.10 Step up chopper		
<i>EEF406-3 Use the relevant power supply in various electronic circuit applications.</i>			
3	Power Supply 3.1 Linear Power Supply 3.2 SMPS 3.3 UPS 3.3.1 Need of UPS 3.3.2 Basic configuration 3.3.3 Types of UPS-On line, Off line	03	08
	Total	24	40

## Section II

Sr. No.	Topics / Sub-topics	Lecture s (Hours)	Theory Evaluation (Marks)
<i>EEF406-4 Assist in maintaining NC/CNC machines.</i>			
4	NC/CNC Machines 4.1 Need of NC/CNC Machines 4.2 Block Diagram of NC/CNC Machines 4.3 Classification of NC/CNC Machines 4.4 Advantages and applications of NC/CNC Machines 4.5 DNC Machines	07	10
<i>EEF406-5 Use relevant cyclo-converter in industrial circuits.</i>			
5	Cyclo-Converters 5.1 Classification of Cyclo-Converters 5.2 Single phase to single phase cycloconverter 5.3 Single phase to bridge Cycloconverters 5.4 Three phase to single phase cycloconverter 5.5 Three phase to three phase cycloconverter	07	12
<i>EEF406-6 Implement suitable DC motor and AC motor speed control method per requirement.</i>			
6	DC And AC Motor Speed Control 6.1 Separately excited dc. Motor using half controlled bridge rectifier 6.2 Concept in D.C. motor drives 6.2.1 Stability 6.2.2 Plugging 6.2.3 Regeneration 6.2.4 Inching	10	18

Sr. No.	Topics / Sub-topics	Lecture s (Hours)	Theory Evaluation (Marks)
	6.3 Single phase SCR drive with armature current and Tachogenerator feedback - block diagram & operation 6.4 Speed control of DC series motor 6.5 Speed control of three phase induction motor 6.5.1 Stator voltage control (Phase control) 6.5.2 Variable voltage variable frequency 6.5.3 Variable current variable frequency. 6.5.4 Slip power recovery control 6.6 Comparison between ac. and dc drives 6.7 Choice between ac and dc drives		
	Total	24	40

**B] Term Work /Practical Exercises and related skills to be developed :**

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
1	Half Controlled Rectifier	3) To understand circuit operation of HWR. 4) To understand waveforms of HWR. 5) To understand voltages and waveforms at different points in circuits.	EEF406-1
2	Full Controlled Rectifier	1) To understand circuit operation of Full Controlled Rectifier 2) To understand waveforms of Full Controlled Rectifier. 3) To understand voltages and waveforms at different points in circuits.	EEF406-1
3	Series Inverter	1) To understand circuit operation of Series Inverter. 2) To understand waveforms of Series Inverter R. 3) To understand voltages and waveforms at different points in circuits.	EEF406-2
4	Parallel Inverter	1) To understand circuit operation of Parallel Inverter. 2) To understand waveforms of Parallel Inverter. 3) To understand voltages and waveforms at different points in circuits.	EEF406-2
5	Jones's Chopper	1) To understand circuit operation of Jone's Chopper. 2) To understand waveforms of Jone's Chopper. 3) To understand voltages and waveforms at different points in circuits.	EEF406-2
6	Morgan's chopper	1) To understand circuit operation of Jone's Chopper. 2) To understand waveforms of Jone's Chopper. 3) To understand voltages and waveforms at different points in circuits.	EEF406-2
7	NC Machines	1) To understand operation of NC Machines.	EEF406-4
8	CNC Machines	1) To understand operation of CNC Machines.	EEF406-4
9	Cycloconverters	1) To understand circuit operation of Cycloconverters. 2) To understand waveforms of Cycloconverters. 3) To understand voltages and waveforms at different points in circuits.	EEF406-5
10	UPS	1) To understand circuit operation of UPS. 2) To understand types of UPS.	EEF406-3

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

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Controlled Rectifiers	06	04	04	EEF406-1	14
2	Inverters And Choppers	04	06	08	EEF406-2	18
3	Power Supply	02	02	04	EEF406-3	08
4	NC/CNC Machines	02	04	04	EEF406-4	10
5	Cyclo-Converters	04	04	04	EEF406-5	12
6	DC And AC Motor Speed Control	04	08	06	EEF406-6	18
	TOTAL	22	28	30		80

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

**D] Assessment Criteria For Term Work And Practical Examination****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
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Progressive Skill Test :**

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

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

Every student has to perform one practical within 3 hours at semester end practical exam which shall be assessed as per following criteria.

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

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

**E] 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

**F] Reference Material :**

**a) Books / Codes**

Sr. No.	Author	Title
1.	M. Rammoorthy	Thyristors and their applications
2	M. Rashid	Power Electronics
3	Harish Rai	Industrial & Power Electronics
4	-----	S. C. R. Manual: General Electric Company
5	Berde	Power electronics and drives

**b) Websites:**

- 1) <http://www.electronics-tutorials.ws/>
- 2) [www.powerelectronics.com](http://www.powerelectronics.com)

\* \* \*

**Course ID :**

Course Name : **SEMINAR**  
 Course Code : **EEF407**  
 Course Abbreviation : **FSMR**  
 Pre-requisite Course(s) : **NIL**

**Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	-	02
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral/ Examination (External)	
Details of Evaluation	-	Continuous assessment of progress of seminar works	-	As per Proforma-III	-	
Marks	-	25 marks each week	-	25	-	25

**Rationale:**

The electrical supervisor and the technician are expected to deliver presentations of their works and ideas regarding their industry and products. They should have the practice to prepare and deliver such presentations to relevant groups of people. This course essays to inculcate the relevant skills for the same in the students.

**Course Competency**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- Prepare and deliver effective seminars.

**Cognitive:** i) understand the different modes of presentations ii) choose the proper applicable mode, and iii) understand how the works to be presented are to be arranged for effective presentation.

**Psychomotor:** i) Use the relevant modes for presentation. ii) prepare and deliver presentations.

**Affective:** Attitudes of i) safety ii) accuracy of words/statements iii) aestheticism in works.

**Course Outcomes:**

EEF407-1. Carry out literature survey on relevant websites and otherwise.

EEF407-2. Prepare presentations and present them using relevant softwares.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” : 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Prepare & deliver effective seminars	2	3	1	3	2	—	3	3	3	3	3	3
EEF407-1 Carry out literature survey on relevant websites and otherwise.	2	2	3	2	3	—	2	2	2	3	1	1
EEF407-2 Prepare presentations and present them using relevant softwares.	3	2	2	2	2	—	2	1	2	2	1	1

**B] Termwork:**

The work will consist of Seminar (individual) to be delivered by each student on any technical related topic collecting the relevant information referring from text book, hand book, technical magazines, reference books, I.S.S. Booklets, different manuals, etc. Further the students will explore and decide their project work for the next semester.

The assessment will be encompass the evaluation of the industrial training outcomes related to technical and other relevant skills gained or enhanced. The separate guideline will be provided.

**(Level V**  
**Diversified Technology Courses)**

**Course ID:**

Course Name : **Testing and Maintenance of Electrical Equipment**  
 Course Code : **EEF501**  
 Course Abbreviation : **FTME**  
 Pre-requisite Course(s) : **EEF307, EEF402.**

**Teaching and evaluation scheme:****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	06
Practical	02	
Tutorial	01	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total marks
	Theory	Practical	Theory Examination	Term Work	Oral/practical 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)		Proforma I	
Marks	20	--	80	-	25 E	125

**Rationale :**

This is technology level subject with application in Industry, commercial, public utility departments such as PWD, Irrigation, electricity supply agencies, water supply & sewage board etc. this course arms the diploma in electrical engineering student to inspect various types of installations, test and commission electrical machines as per prevailing standards. He / She will also be able to carry out different types of maintenances of electrical equipment. He will follow all the safety practices while doing these functions. Further the student will also become well conversant with the techniques of Total Productive Maintenance (TPM).

**Competency**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- Carry out maintenance of electrical machines/equipment following safety practices.

**Cognitive:** Understand the different procedures of testing and maintenance of electrical equipment.

**Psychomotor:** Carry out different tests and maintenance works on electrical equipment.

**Affective:** Develop the attitudes of i) safety ii) accuracy iii) precision and iv) aestheticism.

**Course outcomes:**

EEF 501- 1 Follow safety practices while working and install electrical machines after selecting/executing the relevant foundations.

EEF 501- 2 Prepare maintenance schedules and strategies for electrical machines/equipment.

EEF 501- 3 Maintain motional electrical machines/systems.

EEF 501- 4 Maintain single phase and three phase transformers.

EEF 501- 5 Maintain insulation systems of electrical equipment.



EEF 501- 6 Troubleshoot electrical machines/switchgear.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix****[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" : 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Carry out maintenance of electrical machines/ equipment following safety practices.	2	3	3	1	1	1	2	3	3	3	3	3
EEE501-1: Follow safety practices while working and install electrical machines after selecting/executing the relevant foundations.	2	3	3	3	3	1	3	3	3	3	3	3
EEE405-2: Prepare maintenance schedules and strategies for electrical machines/equipment	3	3	3	3	2	1	1	3	2	3	3	3
EEE405-3: Maintain motional electrical machines/systems	3	3	3	3	2	1	1	3	2	3	3	3
EEE405-4: Maintain single phase and three phase transformers	3	3	3	3	2	1	1	3	2	3	3	3
EEE405-5: Maintain insulation systems of electrical equipment	3	3	3	3	2	2	1	3	2	3	3	3
EEE405-6: Trouble shoot electrical machines/switchgear	3	3	3	3	2	1	1	3	2	3	3	3

**CONTENTS :****SECTION – I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
CO: EEF501-1: Follow safety practices while working and install electrical machines after selecting/executing the relevant foundations.			
1	<b>1.1 Safety &amp; Prevention of Accidents:</b> Safety, hazard, accident, major accident hazard, responsibility, authority, accountability and monitoring. I.E. Act & statutory regulations for safety of persons & equipments working on electrical installation. Dos and don'ts for substation operators as listed in IS, causes of	08	12

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	electrical accidents. Factors on which severity of electric shock depends. Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration. Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers. 1.2 Installation: Factors involved in designing the machine foundation. Requirements of different dimension of foundation for static & rotating machines, procedure for leveling and alignment of two shafts of directly & indirectly coupled drives and effects misalignment. Installation of rotating machines as per I.S. 900-1992.		
CO: EE501-2: Prepare maintenance schedules and strategies for electrical machines/equipment.			
2	Maintenance 2.1 Objectives of testing, significance of I.S, tolerance, routine tests, type tests, special tests. Methods of testing a) Direct, b) Indirect, c) Regenerative. 2.2 Routine, preventive and breakdown maintenance, advantages of preventive maintenance, developing preventive maintenance schedule, factors affecting preventive maintenance schedule. 2.3 Total productive maintenance.	08	12
CO: EE501-3: Maintain motional electrical machines/systems.			
3	Testing & maintenance of rotating machines: 3.1 Type, routine and special tests of single phase and three phase induction motors as per relevant IS. 3.2 Routine, preventive and breakdown maintenance of single phase and three phase induction motors as per IS 9001:1992 3.3 Maintenance schedule of alternators and synchronous machines as per IS 4884-1968	08	16
Total		24	40

## Section II

CO: EE501-4: Maintain single phase and three phase transformers.			
4	Testing & maintenance of Transformers: 4.1 Type, routine and special tests as per IS 2026-1981 4.2 Procedures for conducting following tests: Measurement of winding resistance, no load losses, & no load current, impedance voltage, load losses, insulation resistance, induced over voltage withstand test, separate source voltage withstand test, Impulse voltage withstand test, temperature rise test of oil & winding, different methods of determining temp rise- back to back test, short circuit test, open delta (delta – delta) test. 4.3 Preventive and routine maintenance of distribution transformer as per IS 10028(part III): 1981, periodic checks for replacement of oil, silica gel.	10	16
CO: EE501-5: Maintain insulation systems of electrical equipment.			
5	5.1 Classification of insulating materials as per IS 8504(part III) 1994, factors affecting life of insulating materials, measurement of insulation resistance and interpretation of condition of insulating.	08	12

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	5.2 Methods of measuring temperature of internal parts of windings/machines and applying the correction factor when the machine is hot. 5.3 Properties of good transformer oil, list the agents which contaminates the insulating oil, understand the procedure of following tests on oil as per IS 1692-1978. Acidity, sludge, crackle and flash point tests. 5.4 Filtration of insulating oil, protection of electrical equipments (insulation) during the period of inactivity. 5.5 Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & revarnishing 5.6 Methods of internal heating and vacuum impregnation.		
<b>CO: EEF501-6: Troubleshoot electrical machines/switchgear.</b>			
6	Trouble shooting of electrical machines & switch gear: 6.1 Procedures of trouble shooting of electrical machines. 6.2 Internal and external causes of failure of equipment. 6.3 Types of faults (mechanical, electrical and magnetic) in electrical machines and causes. 6.4 Tools/instruments: Bearing puller, filler gauge, dial indicator, spirit level megger, earth tester, growler, multimeter, 6.5 Trouble shooting charts: single phase and three phase induction motors, single phase and three phase transformers. 6.6 Common troubles in electrical installations and cables. Maintenance and trouble shooting of LV switchgear like MCCB, ELCB, contactors and batteries.	06	12
	Total	24	40

**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	Safety and prevention of accidents..	02	04	06	EEF501-1	12
I / 2	Maintenance	02	04	06	EEF501-2	12
I / 3	Testing and maintenance of rotating machines.	02	04	10	EEF501-3	16
I / 4	Testing and maintenance of transformers.	02	04	10	EEF501-4	16
I / 5	Maintain insulation systems of electrical equipment.	02	04	06	EEF501-5	12
II / 6	Trouble shooting of electrical machines and switch gear	02	04	06	EEF501-6	12
		12	24	44		80

**B. Practical works:**

Sr. no	Practicals	Skills developed	CO
1	Perform OC test on single phase Induction motor	1) Connect the circuit as per circuit diagram 2) Perform the test as per the instructions 3) Calculate the required parameters from observation 4) Conclude the result	EEF501-3
2	Perform OC and SC test on three phase Induction motor	1) Connect the circuit as per circuit diagram 2) Perform the tests as per the instructions 3) Calculate the required parameters from observation 4) Conclude the result	EEF501-3
3	Perform load test on three phase Induction motor	1) Connect the circuit as per circuit diagram 2) Perform the test as per the instructions 3) Calculate the required parameters from observation 4) Draw necessary graph & comment 5) Conclude the result	EEF501-3
4	To perform phasing and polarity out tests on three phase transformer.	1) Connect the circuit as per circuit diagram 2) Perform the test as per the instructions 3) From the test find the polarities	EEF501-4
5	To perform OC and SC tests on single phase transformer	1) Connect the circuit as per circuit diagram 2) Perform the test as per the instructions 3) Calculate the required parameters from observation 4) Conclude from the result	EEF501-4
6	To perform back to back test on two identical single phase transformers	1) Connect the circuit as per circuit diagram 2) Perform the tests as per the instructions 3) Calculate the required parameters from observation 4) Conclude the result	EEF501-4
7	Prepare maintenance schedule & trouble shooting chart for 3ph Induction motor	1) Carry out preventive maintenance & trouble shooting charts for 3 ph induction motors. 2) Procedure to be followed in the preventive maintenance of the 3ph motors.	EEF501-3,5,6
8	Prepare maintenance schedule & trouble shooting chart for 3ph Transformers	1) Carry out preventive maintenance & trouble shooting charts for 3 ph transformers. 2) Procedure to be followed in the preventive maintenance of 3ph transformers.	EEF501-4,5,6

**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

**C) INDUSTRIAL EXPOSURE:**

Visits to transformer testing and maintenance sections of industrial units.

**Instructional strategies:**

- 1) Lectures and discussions.
- 2) Industrial visits.
- 3) Time bound assignments.

**Teaching and Learning resources, including references:**

- 1) Chalk-board.
- 2) Demonstrative kits, videos
- 3) Demonstrative charts.

**Books:**

Sr. No.	Author	Title	Publisher
1	Bureau of Indian standards.	Relevant IS codes.	
2	B. L. Theraja	Electrical Technology Volumes I To IV	S. Chand & Co., New Delhi
3	B. V. S. Rao	Operation & Maintenance Of Electrical Machines Volume - I	Media Promoters & Publisher Ltd. Mumbai
4	B. V. S. Rao	Operation & Maintenance Of Electrical Machines Volume - II	Media Promoters & Publisher Ltd. Mumbai
5	C.J. Hubert	Preventive Maintenance Hand Books & Journals	
6	Bhattacharya	Electrical machines	Tata McGraw Hill

**Course ID :**

Course Name : **Electrical Machines Control & Automation**  
 Course Code : **EEF502**  
 Course Abbreviation : **FMCA**  
 Pre-requisite Course(s) : **EEF 307, EEF 402.**

**Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

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

**Rationale :**

A technician engineer has to look after the day to day the operation, control and maintenance of controllers used in various electrical systems, for trouble free working of electrical drives. He should be conversant with the various technical aspects of control pilot devices, control relays & contactors such as principle, construction, working and performance. The course is therefore intended to cater to the needs and requirements of using controllers as per the needs

**Competency:** Maintain the various electromagnetic devices & components of machine controls.

**Cognitive :** Understand the working of different devices & components for machine controls.

**Psychomotor :** Implement machine control schemes for machines.

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

**Course outcomes :**

EEF 502 -1 Use various electromagnetic devices & components of machine controls.

EEF502 -2 Select relevant industrial control devices

EEF502 -3 Prepare schemes for protection of motors.

EEF502 -4. Prepare & implement power and control circuit for induction motors

EEF502 -5 Prepare & implement schemes for control & operation of industrial control circuits

EEF502-6 Use PLC for implementing simple industrial controls

**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	PSO1 Plan and Design	PSO2 Construction and Maintenance
Maintain the various electromagnetic devices & components of machine controls.	3	3	3	2	2	–	-	2	1	3	3	3
EEF 502 -1 Use various electromagnetic devices & components of machine controls.	3	3	3	2	1	–	-	3	1	3	2	3
EEF502 -2 Select relevant industrial control devices	2	3	2	3	3	–	-	2	1	2	3	3
EEF502 -3 Prepare schemes for protection of motors.	3	3	3	3	3	–	-	2	1	2	3	3
EEF502 -4. Prepare & implement power and control circuit for induction motors	3	3	2	3	3	–	-	1	1	3	2	2
EEF502 -5 Prepare & implement schemes for control & operation of industrial control circuits	3	2	3	3	2	–	-	1	1	2	3	3
EEF502-6 Use PLC for implementing simple industrial controls	3	2	3	2	2	–	-	3	1	3	3	3

**Content :****A) Theory :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEF502-1 Use various electromagnetic devices & components of machine controls			
1	General Idea of Controls 1.2 Disadvantages of Manual Control 1.3 Introduction to Magnetic Control 1.4 Advantages of Magnetic control 1.5 Semi-automatic and Automatic Control of Modern Machinery 1.6 Development of Control Circuit 1.6.1 Development of 2-wire and 3-wire Control. 1.6.2 Remote Control Operation of a Motor 1.6.3 Interlocking of Drives	03	08
EEF502-2 Select relevant industrial control devices			
2	Control Circuit Components (A) 2.1 Fuses, Switches and Fuse-Switch units: Rewirable, HRC & Semiconductor Fuses 2.2 Contactors: Solenoid Type, Clapper type, Lock-out Type, Inductive Accelerating, Contactor Ratings 2.3 Relays: Voltage Relays, D.C. Series Current Relay, Frequency Responsive Relay, Latching Relays 2.4 Over-load Relays: Bimetallic Thermal Over-load Relay, Electronic Overload Relay,	06	10

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
2.	2.5 Time Delay Relays ( Timers ): Thermal Timer, Pneumatic Timer, Motor Driven Timers, Electronic Timer, Phase Failure Relay ( Single Phasing Preventer) 2.7 Various symbols for control circuit components		
	B) 2.6 Switches & Their selection 2.10 Push Button Switches 2.11 Selector Switches 2.12 Drum Switches 2.13 Limit Switches: A Simple Limit Switch, Rotary Cam type Limit Switches, Heavy Duty Limit Switches, Speed Actuating Sensing Switches 2.14 Solenoid Valves 2.15 Pressure Switches - Flow Switches 2.16 Pressure Transducer - Flow Transducers 2.17 Temperature Switches ( Thermostats ) 2.18 Float Switch, 2.19 Control Transformer 2.20 Symbols for Various Components 2.21 Control Diagrams / Power Diagrams	06	10
EEF502-3 Prepare schemes for protection of motors			
3	Protection Of Motors 3.1 Protection of AC Motors 3.2 Selection of Fuse, Over-load Relay, Contactor & Circuit Breaker Operating Characteristics 3.3 Over-load, Short-circuit, and Over-temperature Protection 3.3.1 Over-load and Short Circuit Protection 3.3.2 Over-temperature Protection (Thermistor) 3.3.3 Under Voltage Protection 3.3.4 Phase Failure and Phase Reversal Protection 3.3.4 Thermistor Protection- Positive, Negative	09	12
	<b>Total</b>	<b>24</b>	<b>40</b>

**Section II**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEF502-4 Prepare and implement power and control circuits for induction motors			
4	Industrial Machine Power and Control Circuits 4.1 starters for 3 phase induction motors 4.1.1 DOL starters for 3 phase induction motors 4.1.1 Power and control circuits of forward-stop-reverse type. 4.1.2 Power and control circuits of forward and random reversing type 4.2 Star delta starters & auto transformer starters for 3 phase induction motors	09	20



Sr. No.	Topics / Sub-topics	Lecture s (Hours)	Theory Evaluati on (Marks)
	4.2.1 Power and control circuits of semi automatic type. 4.2.2 Power and control circuits of automatic type using timer 4.2.3 Power and control circuits for motors using autotransformer type starters 4.3 Starters for slip ring induction motors 4.3.1 Power and control circuits for Definite Time Limit Starter 4.3.2 Power and control circuits for Current Limit Acceleration Starter 4.3.3 Power and control circuits for Secondary Frequency Acceleration Starter 4.4 Plugging and dynamic braking of induction motors 4.4.1 Control and power circuits for simple plugging of motor 4.4.2 Dynamic Braking - D.C. injection braking power & control diagrams		
EEF502-5 Prepare & implement schemes for control & operation of industrial control circuits			
05	Industrial control circuits Planer Machine, Automatic control for a pump. Lifting magnet. control of Electrical Oven. Overhead crane.	06	10
EEF502-6 Use PLC for implementing simple industrial controls			
06	Programmable Logic Controller 6.1 Block diagram of PLC. 6.2 PLC advantages and disadvantages. 6.3 Advantages of digital logic over relay logic. 6.4 Working of a Programmable Logic Controller . 6.5 Ladder diagrams. 6.5.1 Typical PLC inputs. 6.5.2 Typical PLC Outputs. 6.5.3 One contact, one coil circuit. 6.5.4 Standard start-stop-seal circuit. 6.5.5 Ladder diagrams for simple logic operations(NOT, AND, OR, EXOR). 6.5.6 On delay timer, off delay timer. 6.5.7 Ladder diagrams for DOL, Star-delta (automatic) starters. 6.5.8 Up and down counter.	09	10
	<b>Total</b>	<b>24</b>	<b>40</b>

## B) 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	General Idea of Controls	02	02	04	EEF502-1	08
2	Control Circuit Components	00	04	16	EEF502-2	20
3	Protection Of Motors	02	04	06	EEF502-3	12
4	Industrial Machine Power and Control Circuits	04	04	12	EEF502-4	20
5	Industrial control circuits	02	02	06	EEF502-5	10
6	Programmable Logic Controller	02	02	06	EEF502-6	10

## C) 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 Electrical Machine Control & Automation* 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
01	Draw Symbols used in electromagnetic control circuit diagrams	Interpret the symbols used in control circuit.	EEF502-2
02	Operation of contactors	1) Connect contactors in circuits. 2) Identify the coil, contacts, reset link and other parts. 3) Understand control circuit importance. 4) Appreciate the power line linkage it has	EEF502-2
03	Operation of different types of switches, relays used in motor control circuits	1) Identify the various components used in motor control circuits. 2) Connect them in circuits and confirm their operation	EEF502-2
04	Operation of Direct-On-Line (DOL) starter	1) Identify the various parts of the DOL starter. 2) Connect them in the motor circuit. 3) Operate the starter. 4) Draw the control and power circuit diagrams	EEF502-4
05	Operation of Direct-On-Line (DOL) starter with Reversing Control	1) Identify the various parts of the DOL starter. 2) Connect them in the motor circuit. 3) Operate the starter. 4) Appreciate the reversing characteristics. 5) Draw the control and power circuit diagrams	EEF502-4
06	Study of Semi-automatic & Fully Automatic Star-Delta Starter	1) Identify the various parts of the two starters. 2) Connect them in the motor circuit. 3) Operate the starters and verify their operation. 3) Appreciate their operating characteristics. 4) Draw the control and power circuit diagrams	EEF502-4
07	Operation of motor control circuit of an electric oven	1) Identify the various parts of the oven. 2) Connect them in the motor circuit. 3) Operate the oven and verify the operation.	EEF502-5

		4) Appreciate the operating characteristics. 5) Draw the control and power circuit diagrams	
08	Components of PLC: draw symbolic representation of at least 20 components used to create ladder diagrams	1) To understand principle of operation of Programmable Logic Controller 2) To understand Ladder diagram. 3) To understand analog/digital I/O Modules.	EEF502-6

**D) Industrial exposure :**

(Included in Laboratory Manual for Electrical Machine Control & Automation )  
Industrial Visits to field works.(3 Visits)

**E) Assessment Criteria for Term work :****i) Continuous Assessment of Practical Assignments :**

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

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

**ii) Progressive Skill Test :**

One mid-term *Progressive Skill Test* of 25 marks shall be conducted as per criteria given in *Laboratory Manual for Electrical Machine Control & Automation*

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

**F) 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

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

Sr. No.	Author	Title	Publisher
1.	Eshwar U. S.	Handbook of Electric Motor Controls	Tata McGraw Hill
2.	Bhattacharya & Singh	Control of Electrical Machines	New Age International Publishers
3	Webb & Reis	Programmable Logic Controllers principles and applications	Prentice Hall India
3.	Biswanath Paul	Industrial electronics and control (including Programmable Logic Controller) [3rd edition]	Prentice Hall India
4.	Bryan & Bryan	Programmable Controllers Theory and Implementation	An Industrial Text Company Publication
	John R. Hackworth, Frederick Hackworth	Programmable Logic Controllers	Pearson

CDs, PPTs, Models, Charts etc: Teachers must use educational software such as that available on the internet (eg. TRiLOGI, SIEMENS etc) for the PLC.

Websites:

1. [www.brothersoft.com/download/plc-simulator](http://www.brothersoft.com/download/plc-simulator),
2. [www.edusoft.co.za/ladsim.htm](http://www.edusoft.co.za/ladsim.htm)

**Course ID :**

Course Name : **PROJECT**  
 Course Code : **EEF 503**  
 Course Abbreviation : **FPRJ**  
 Pre-requisite Course(s) : **NIL**

**Teaching and evaluation scheme :**

Teaching Scheme :

Scheme component	Hours / week	Credits
Theory	-	04
Practical	04	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Oral/ Examination (External)	
Details of Evaluation	-	-	Term End Theory Exam (03 hours)	As per Proforma-VI	As per Proforma-IV	
Marks	-	--	-	25	50 E	75

**Rationale:**

The electrical supervisor and the technician are expected to carry out self motivated activities, assigned minor project tasks and other similar activities. Hence they should be conversant with the minimum skills required to carry out small assignments in a group. They should also have inclination to master the skills of market surveys, interpret them and carry out related actions.

The work may consist of:

- Fabricate , rewind, assemble, testing etc of Electrical machine such as Transformer , AC/ DC motor in Industries/Institute.
- Analysis of Energy Conservation/ Energy Audit of Commercial Buildings/Hostels/Hospitals/Industries
- Study of Control Panels in Industries.
- Any Technical Project related to Electrical, Electronics, Instrumentation etc in Industries/Institute

**Course Competency:**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- Carry out the selected project work as a group member.

**Cognitive:** i) understand the different methods to implement project works, ii) choose the applicable mode for different activities, and iii) understand how the works to be presented are to be arranged for effective presentation.

**Psychomotor:** Use different tools and the relevant methods for project works.

**Affective:** Attitudes of i) safety ii) group handling/works iii) accuracy of words/statements, iv) aestheticism in works.

**Course Outcomes:**

EEF503.1 Prepare action plan/activity chart for project works.

EEF503.2 Implement the project work as per activity chart to complete it

EEF503.3 Present the project work in front of a group.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

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	PSO1 Electrical Equipment	PSO2 Electrical power systems
<i>Competency:</i> Carry out the selected project work as a group member.	3	3	3	3	3	–	1	3	3	3	3	3
EEF503.1 Prepare action plan/activity chart for project works.	3	3	3	3	3	–	1	3	3	3	3	3
EEF503.2 Implement the project work as per activity chart to complete it.	3	3	3	3	3	–	1	3	3	3	3	3
EEF503.3 Present the project work in front of a group.	3	3	3	3	3	–	3	3	3	3	3	3

Criteria for assessment at oral examination:

Covering the Project for the oral examination, ten questions at varied levels

**A] INDUSTRIAL EXPOSURE :**

SN	Mode of Exposure	Topic
1.	Visit to outdoor substation	Study all components
2.	Visit to LT Switchgear manufacturing unit	Study all components
3.	Other relevant industrial visits as needed.	Project related components, process, work study

**B] Instructional strategies:**

- 1) Lectures and discussions.
- 2) Industrial visits.
- 3) Time bound assignments and work.

**C] Teaching and Learning resources, including references:**

- 1) Chalk-board.
- 2) Demonstrative kits.
- 3) Demonstrative charts.

**D] Books:**

- 1] Project related reference books.
- 2] Various electrical and electronics journals.
- 3] Company handbooks.
- 4] Study of reference books of Electrical Machines, Power systems, Switchgear, Power electronics, Microprocessors and controllers.

**COURSE ID :**

**Course Name** : MICROCONTROLLERS  
**Course Code** : EEf 504  
**Course Abbreviation** : FMCS

**TEACHING AND EVALUATION SCHEME:**

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

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme:**

Mode of Evaluation	Progressive Assessment		Term End Examination		Total
	Theory	Practical	Theory Examination	Practical	
<b>Details of Evaluation</b>	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-I	
<b>Marks</b>	<b>20</b>	<b>--</b>	<b>80</b>	<b>25E</b>	<b>125</b>

E-External Examination

**RATIONALE:**

An electronic engineer working in industry has to deal invariably with microcontrollers. In this regard, the course 8051 Microcontroller is designed in such a way that the student undergoing through it will understand not only theoretical background but also design and practical concepts.

The technology of microprocessor has led to a single chip Microcontroller technology MCS-51 family. Architecture, details of 8051 Microcontroller and its programming is covered in this subject. Use of assembler and stimulator for programming of Microcontroller will make the students equipped for the development of embedded systems.

**COMPETENCY:**

Build 8051 microcontroller based systems for different engineering applications.

**Cognitive :** Understanding 8051 microcontroller architecture, working and instruction set.

**Psychomotor :** Write assembly language programs for wide range of applications.

**Affective :** Attitude of i) Logic ii) accuracy iii) precision v) punctuality

**COURSE OUTCOMES:**

**EIF 309-1** Differentiate among variety of microcontrollers based on their features.

**EIF 309-2** Identify/Discover the architectural details of 8051 microcontroller and illustrate its functioning.

**EIF 309-3** Use instructions from the instruction set of 8051 to write basic assembly language programs to develop logic.

**EIF 309-4** Explore programming skills for I/O ports, Timers/Counters and interrupts of 8051.

**EIF 309-5** Design interfacing of I/O devices with 8051 and write programs for it.

**EIF 309-6** Develop 8051 microcontroller based systems for various 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	PSO 1 Operation and Maintenance	PSO 2 Supervision and Providing Solution
<b>Competency:</b> Build 8051 microcontroller based systems for engineering applications	-	2	1	1	-	-	-	1	-	1	2	1
<b>EIF 309-1</b>	-	1	-	-	-	-	-	-	-	1	-	-
<b>EIF 309-2</b>	-	1	-	-	-	-	-	-	-	1	-	-
<b>EIF 309-3</b>	-	3	1	-	-	-	-	1	-	1	1	-
<b>EIF 309-4</b>	-	3	3	1	-	-	-	1	-	1	3	2
<b>EIF 309-5</b>	-	3	3	1	-	-	-	1	-	1	3	2
<b>EIF 309-6</b>	-	3	3	1	-	-	-	1	-	1	3	2

**CONTENT:****THEORY : SECTION I**

Chapter	Topic Subtopics	Teaching Hours	Theory Evaluation Marks
<b><i>EIF 309-1 Differentiate among variety of microcontrollers based on their features.</i></b>			
01	<b>Introduction and Overview of 8051 family</b> 1.1 Introduction to single board microcomputer. 1.1.1 Block Diagram of Microcomputer. 1.1.2 Elements of Microcomputer. (Buses, Microprocessor, memory, I/O devices). 1.1.3 Different types of buses: address, Data, and control bus 1.2 Introduction to Microcontroller 1.2.1 General block diagram of microprocessor and microcontroller 1.2.2 Comparison of Microprocessors and Microcontrollers. 1.2.3 Types of architectures - Harvard and Von-neuman. 1.3 Selection factors of microcontroller (Architecture type, speed, Word size, instruction set, memory, and I/O capability) 1.4 8051 family members and its comparison– 8052, 8031, 8751, AT89C51, DS89C4x0 1.5 Introduction to Microcontroller programming simulation software like – KEIL compiler	06	08
<b><i>EIF 309-2 Identify/Discover the architectural details of 8051 microcontroller and illustrate its</i></b>			

<i>functioning.</i>			
02	<b>8051 Architecture</b> 2.1 8051 Architecture 2.1.1 Features 2.1.2 Architectural block diagram, 2.1.3 Pin description of 8051 2.1.4 Accumulator and B register, PSW 2.1.5 Memory Organization: Internal RAM and ROM Only architectural features of following 2.1.6 I/O ports 2.1.7 Timers/Counters-TCON,TMOD 2.1.8 Serial port-SCON,PCON,SBUF 2.1.9 Interrupts-IE,IP 2.2 Special Features of 8051 2.2.1 Boolean Processor 2.2.2 Power saving options- idle and power down mode.	12	16
<b><i>EIF 309-3 Use instructions from the instruction set of 8051 to write basic assembly language programs to develop logic.</i></b>			
03	<b>Instruction set and programming:</b> 3.1 Instruction format and addressing modes 3.2 Data transfer instructions 3.3 Logical and rotate instructions 3.4 Arithmetic instructions 3.5 Jump and call instructions 3.6 simple programs	14	16
	<b>Total:</b>	<b>32</b>	<b>40</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**SECTION II**

Chapter	Topic Subtopics	Teaching Hours	Theory Evaluation Marks
<b><i>EIF 309-4 Explore programming skills for I/O ports, Timers/Counters and interrupts of 8051.</i></b>			
04	<b>Programming of 8051:</b> 4.1 Timer/Counter programming 4.1.1 Timer / Counter logic and modes 4.2.2 Simple programs on timer to generate time delay using polling and interrupt method. 4.2 Parallel Port-I/O port Structure and its Programming 4.3 Serial port of 8051 4.3.1 Modes of serial communication 4.3.2 Simple programs for serial communication 4.4 8051 Interrupts 4.4.1 Interrupts and polling. 4.4.2 Simple programs based on interrupts and polling method	12	16
<b><i>EIF 309-5 Design interfacing of Memory &amp; I/O devices with 8051 and write programs for it.</i></b>			



05	<b>Memory and I/O Interfacing</b> 5.1 Memory Interfacing- 5.1.1 Interfacing External RAM and ROM 5.2.2 Address Map table 5.2.3 Linear and absolute decoding techniques 5.2.4 Simple example showing interfacing of ROM and RAM(upto 8X8K) 5.2 I/O Interfacing: 5.2.1 Interfacing of LED, keys, Relays, Seven segment display 5.2.2 Port expansion using 8-bit bidirectional buffer like 74LS245	10	14
<b>EIF 309-6 Develop 8051 microcontroller based systems for various applications.</b>			
06	<b>Applications</b> Interfacing diagram with programming of following with 8051 6.1 Key-board interfacing (4X4 Matrix keyboard), concept of key bouncing and de-bounce logic. 6.2 LCD display interfacing 6.3 8 bit ADC and DAC interfacing (0808/0809) 6.4 Stepper Motor interfacing	10	10
	<b>Total:</b>	<b>32</b>	<b>40</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

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

Topic no.	Name of the Topic	Distribution Of Marks (Level Wise)			Course Outcome	Total Marks
		Remember	Understand	Applications		
1	Introduction & Overview of 8051 family	6	2	0	EEF 504-1	08
2	8051 Architecture	4	6	6	EEF 504-2	16
3	Instruction set and programming	4	4	8	EEF 504-3	16
4	Programming of 8051	4	2	10	EEF 504-4	16
5	Memory and I/O Interfacing	4	4	6	EEF 504-5	14
6	Applications	2	2	8	EEF 504-6	10
				<b>TOTAL</b>		<b>80</b>

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

**B] TERM WORK** Term work shall consist of the following :  
**(Minimum Eight From List)**

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

Sr No	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
1	Introduction to KEIL Compiler software	Use KEIL compiler software for assembly language programming 8051 microcontroller	EEF 504-1

Sr No	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
2	Addition and subtraction of 8 & 16 bit numbers, 8-bit addition of BCD numbers	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-3
3	Multiplication and division of 8 bit numbers	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-3
4	Block transfer and Block Exchange	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-3
5	Even & odd number	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-3
6	Largest and smallest number	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-3
7	Ascending & Descending order	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-3
8	Square wave generation using timer delay	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-4
9	Serial Transmission	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Writing, Compiling, debugging, and execution of program</li> </ol>	EEF 504-4
10	Stepper motor interfacing	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Interfacing given stepper motor with 8051 MC</li> <li>4. Writing program for rotating motor in clockwise/anticlockwise</li> <li>5. Compiling, debugging, and execution of program</li> </ol>	EEF 504-4 , 5
11	Display given message (LCD interfacing)	<ol style="list-style-type: none"> <li>1. Acquire Logical thinking ability</li> <li>2. Identify the suitable instructions for the given problem</li> <li>3. Interfacing LCD with 8051 MC</li> </ol>	EEF 504-4, 6

Sr No	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
		4. Writing, Compiling, debugging, and execution of program	
12	ADC/DAC Interfacing	1. Acquire Logical thinking ability 2. Identify the suitable instructions for the given problem 3. Interfacing given ADC/DAC with 8051 MC 4. Writing program for conversion, 5. Compiling, debugging, and execution of program	EEF 504-5 6
13	LED, Relay, Keyboard Interfacing	1. Acquire Logical thinking ability 2. Identify the suitable instructions for the given problem 3. Interfacing LED ,Relay ,Keyboard with 8051 MC 4. Writing, Compiling, debugging, and execution of program	EEF 504-5,6
14	Mini Project(Compulsory)	8051 based measurement system having ADC/DAC, LCD,etc (Any application)	EEF 504-4,5,6

### C] 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 25 marks as per given criteria.

##### ii) Progressive Skill Test:

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

#### Criteria for Progressive Assessment of Practical and Skill Test

Domain	Particulars	Marks out of 50
Cognitive	Technical preparedness for practical	05
Psychomotor	Algorithm /Flowchart	05
	Program/Logic	05
Affective	Discipline and punctuality	05
	Decency and presentation	05
<b>TOTAL</b>		<b>25</b>

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

Every student has to perform one practical within 3 hours at semester end practical exam which shall be assessed as per following criteria

Domain	Particulars	Marks out of 50
Cognitive	Technical Ability	05
	Logical Approach	05
Psychomotor	Presentation/ Algorithm and Flowchart	10
	Programming skill	10
Affective	Discipline and punctuality	10
	Decency and presentation	10
<b>TOTAL</b>		<b>50</b>

Assessment at semester end practical exam as per Pro-forma I

### D] 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. PPT Slides
4. Question Bank
5. Charts

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

Sr.No.	Author	Title	Publisher
1	Keneth J. Ayala	The 8051 Microcontroller	Pen Ram International
2	M. A. Mazidi	The 8051 Microcontroller and Embedded systems	Pearson Edition, Prentice Hall
3	Ajay Deshmukh	Microcontrollers (Theory & Applications)	Tata Mc-graw Hill

**b) Websites:**

1. [www.nxp.com](http://www.nxp.com)
2. [www.datasheet.com](http://www.datasheet.com)
3. [www.nptel.ac.in](http://www.nptel.ac.in)

**Course ID**

**Course Name** : Electric Drives.  
**Course Code** : EE505.  
**Course Abbreviation** : FELD.  
**Pre-requisite Course(s)** : EE507, EE502, EE506.

**Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	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	25I	-----	125

**Rationale:**

Nowadays electric motors are the main source of driving equipment. Electric motors are available in very wide range of power rating from few watts to many hundreds of Mega watts, in applications ranging from very precise, high performance robotic to variable speed for adjusting flow rates in pumps. These motors are electronically controlled by using power electronic converters as an interface between the input power & the motor. Therefore these controls are very efficient, less expensive & reliable.

This subject will develop the technical skill for industrial activity, to develop the technical skill, such as testing, trouble shooting & maintenance of industrial drives also to supervise manufacturing of drives & installation of industrial drives.

**Course competency** : Use and maintain electric drives in engineering applications.

**Cognitive** : Understand the working of electric drives.

**Psychomotor** : Carry out maintenance of electric drives.

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

**Course outcome:**

- EE505 -1. Select the relevant drives as per need of application.
- EE505 -2. Interpret loading behavior / characteristics of electric motor.
- EE505 -3. Use various controls for AC motors.
- EE505 -4. Use chopper circuits for control of IM.
- EE505 -5. Use converter circuits for control of IM.
- EE505 -6. Implement various drives at different stages in industries like cement, textile, steel rolling.

**Competency, course outcomes and programme outcomes/ programme specific outcomes (cp-co-po/ps) matrix**

[ Note : Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High),“0”]

Competency CO , PO & PSO	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 Electrical Equipment	PSO2 Electrical Power systems
Competency Use and maintain electric drives in engineering applications.	3	3	3	2	3	–	–	–	–	2	3	3
EEF 505 -1. Select the relevant drives as per need of application.	3	3	2	2	2	–	–	–	–	2	3	3
EEF 505 -2. Interpret loading behavior /characteristics of electric motor.	3	3	3	3	2	–	–	–	–	3	3	2
EEF 505 -3. Use various controls for AC motors.	2	3	3	2	1	–	–	–	–	2	3	3
EEF 505 -4. Use chopper circuits for control of IM.	3	3	1	2	3	–	–	–	–	2	1	2
EEF 505 -5. Use converter circuits for control of IM.	2	3	2	2	3	–	–	–	–	2	2	2
EEF505 – 6 Implement various drives at different stages in industries like cement, textile, steelrolling.	2	2	1	2	2	–	–	–	–	2	2	2

**A] Course contents****Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF505-1 Select the relevant drives as per need of application.			
1	Introduction 1.1 Basic elements of drive 1.2 Types of drives.[ Nature of supply, motor, group & Individual based ] 1.3 Requirement of adjustable speed AC drive. 1.4 Advantage based comparison of drives.	04	8
EEF505-2 Interpret loading behavior / characteristics of electric motor			
2	Characteristics of electric motors 2.1 Factors for drive selection 2.4 Characteristics & specifications of 2.4.1 Three phase induction motor, 2.4.2 Synchronous motor 2.4.3 Single phase induction motor 2.4.4 DC Shunt and series motor	10	16

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	2.5 Starting of electric motors 2.6 Braking of electric motor. 2.7 Governing factors for selection of motor for AC drive		
EEF505-3 Use various controls for AC motors.			
3	Induction motor control 3.1 Starting of three phase AC IM and Synchronous motor [ Star –Delta, Liquid, Smooth or step less] 3.2 Different methods of speed control 3.2.1 Stator voltage control 3.2.2 Rotor voltage control. 3.2.3 Frequency control 3.2.4 Slip energy recovery system 3.2.5 Pole changing method 3.4 Speed control by variable frequency converter of IM. 3.3 Advantages of converter fed IM	10	16

### Section II

Sr. No.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF 505-4 Use chopper circuits for control of IM.			
4	Chopper controlled single and three phase IM 4.1 Frequency control Inverter using Power MOSFET 4.2 Chopper controlled resistance in rotor circuit 4.3 Controlled rectifier fed AC motor drive 4.4 Single phase series inverter 4.5 Basic chopper circuit Set up 4.5.1 First quadrant chopper drive 4.5.2 Two quadrant chopper drive (Class A & Class B) 4.5.3 Four-quadrant chopper drive. 4.6 Three phase inverter for three phase IM	06	10
EEF505-5 Use converter circuits for control of IM.			
5	Converter controlled DC motor 5.1 Type of single phase converter drive DC motor. 5.1.1 Single phase half wave converter drive. 5.1.2 Single phase semi converter drive. 5.1.3 Single phase full converter drive. 5.1.4 Single phase dual converter drive. 5.2 Type of three phase converter drive DC motor. 5.2.1 Three phase half wave converter drive. 5.2.2 Three phase semi converter drive. 5.2.3 Three phase full converter drive. 5.2.4 Three phase dual converter drive. 5.3 DC drive performance.	08	14
EEF505-6 Implement various drives at different stages in industries like cement, textile, steel rolling.			

6	Advance techniques of motor control 6.1 Microcomputer in DC drive 6.2 Phase locked loop control 6.3 Microcontroller based stepper motor control 6.4 Microprocessor based DC motor control 6.5 PLC controlled motor drives. 6.6 Block diagram, Sequence of stages & drives required at each stage for following applications.-Cement ,Textile ,Steel Rolling, Paper & Sugar Mills.	10	16
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Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks Cognitive based (level wise)			Course outcome	Total marks
		Remember	Understanding	Application		
I / 1	Introduction	4	4	-	EEF505-01	8
I / 2	Characteristics of electric motors	4	4	8	EEF505-02	16
I / 3	Induction motor control	4	4	8	EEF505-03-	16
II / 4	Chopper controlled DC motor	2	4	4	EEF505-04-	10
II/5	Converter controlled DC motor	4	4	6	EEF505-05-	14
II /6	Advance techniques of motor control	4	4	8	EEF505-06	16

**B: TERMWORK:**

Laboratory experiences and related skills developed, Minimum eight to be performed.

Sr. no	Laboratory experience	Skills developed	Course outcome
1	Study of load torque speed characteristics of AC motor	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Plot characteristics	EEF505-01
2	Study of load torque speed characteristics of DC motor	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Plot characteristics	EEF505-01
3	Study of speed control of IM by stator voltage control	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Understand relation between stator voltage & speed.	EEF505-02-
4	Study of speed control of IM by varying rotor resistance.	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Understand relation between rotor resistance & speed.	EEF505-03-
5	To study speed torque relation of DC series motor.	1. Connect the various components as per the circuit diagrams 2. Note down readings	EEF505-04-



		3. Plot characteristics	
6	To study speed torque relation of DC shunt motor.	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Plot characteristics	EEF505-04
7	Study of single-phase converters.	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Observe & draw waveforms .	EEF505-05
8	Study of three-phase converter.	1. Connect the various components as per the circuit diagrams 2. Note down readings 3. Observe & draw waveforms .	EEF505-05
9	Study of Fuzzy logic based control of motor.	1. Draw block diagram. 2. Note different controls on the machine. 3. Observe effects of different controls.	EEF505-06-
10	Study of microcontroller based speed control of stepper motor	1. Draw block diagram. 2. Write program for stepper motor speed control. 3. Interface stepper motor with microcontroller. 4. Run the program..	EEF505-06-

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.

Books:

1. Thyristor control of Electric Drives ( Vedam Subrahmanyam) TMH publication
2. Electrical Drives (Vedam Subrahmanyam) TMH publication
3. Power Electronics (by P C Sen) TMH publication
4. Power Electronics circuits devices & Applications ( Mohammad H Rashid) PHI Publication
5. Power Electronics converters applications & Design ( Mohan Undeland Robbins)
6. A text book of Electrical Technology Vol-II (A L Theraja, B L Theraja) S Chand

**Course ID :****Course Name : Programmable Logic Controller****Course Code : EEF506****Course Abbreviation : FPLC****Pre-requisite Course(s) : nil****Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	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:**

The fast developing industry is cruising towards finer control of the machines used. In these days machines which were unusual in the past decade are very commonly used now a days; the most common examples being the A.C. and D.C. Servomotors, stepper motors, eddy current drives etc. This course intends to give introductory and working information about such machines which are used for some common and well known applications.

**Competency:**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- Assist in maintaining PLC systems.

Cognitive: Identify the components of PLC systems.

Psychomotor: Work on PLC systems.

Affective: Attitude of i) safety ii) accuracy iii) aestheticism in works.

**COURSE OUTCOMES:**

EEF506-1. Identify PLC components and modes of operations.

EEF506-2. Work on Input / output modules.

EEF506-3. Handle PLC communication and data sections.

EEF506-4. Use with PLC instructions.

EEF506-5. Trouble shoot PLC connections.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" : 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 Electrical equipment	PSO 2 Electrical power systems
Competency: Assist in maintaining PLC systems.	3	1	3	1	1	—	1	2	1	2	3	3
EEF506-1. Identify PLC components and modes of operations.	3	2	3	1	1	—	1	2	1	2	3	3
EEF506-2. Work on Input / output modules.	3	2	3	2	1	—	1	2	1	3	3	3
EEF506-3. Handle PLC communication and data sections.	3	2	3	2	1	—	1	2	1	2	3	3
EEF506-4. Use with PLC instructions.	3	2	3	1	1	—	1	2	1	2	3	3
EEF506-5. Trouble shoot PLC connections.	1	3	3	2	1	—	2	3	2	3	3	3

## CONTENTS :

## Section I

Sr. no.	Topics / sub-topics	Teaching (Hours)	Theory evaluation Marks
EEF506-1. Identify PLC components and modes of operations.			
1	PLC Block diagram of PLC, elements of PLC, Operation of PLC, common terms in PLC, Advantages & Disadvantages of PLC. PLC Processors: Processor operating cycle, Processor operating modes, Processor operating systems and processor status indicators. PLC Memory System memory, Application memory, Memory requirement.	10 (02) (04) (04)	20 (04) (08) (08)
EEF506-2. Work on Input / output modules.			
2	Input and output modules  Input Modules Types, special Input modules, Specifications of typical DC Input module, Typical Discrete & Analog Input field devices, Wiring diagram.  Output Modules Discrete Output modules, TTL module, Relays Output modules, Analog output modules, Other output modules, Specifications of typical output module, Typical Discrete & Analog output field devices, Wiring diagram, Module selection considerations	14  (07)  (07)	20  (10)  (10)
	Total	24	40

## Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF506-3. Handle PLC communication and data files.			
3	PLC communications and data files: PLC Communications Basic communication, Transmission methods, Communication protocols, RS 485 standards. Data Files Data files, user defined files, File structure for PLC.	08 (4)  (4)	12 (6)  (6)
EEF506-4. Use with PLC instructions.			
4	PLC Instructions Classification, logic functions, Bit Instructions, Logical & MOVE Instructions, Timer and counter Instructions, Comparison Instructions, Math Instructions, Advanced Math Instructions, Sequencer Instructions, Bit shift Instructions, File function Instructions, PID Instructions.	10	18
EEF506-5. Trouble shoot PLC connections.			
5	Troubleshooting Connection & Applications Steps for Troubleshooting, Troubleshooting methods, faults & safety, PLC Maintenance, Electrical connections, Applications	6	10

Specification table for setting question paper for semester end theory examination

Section/ Topic No	Name Of Topic	Distribution of Marks (level wise)			Total Marks
		Remember	Understand	Application	
I/1	PLC, processors and memory.	4	8	8	20
I/2	Input and output Modules	4	8	8	20
II/3	PLC Communications and data files.	2	4	6	12
II/4	PLC Instructions	4	6	8	18
II/5	Troubleshooting Connection & Applications	2	4	4	10

**Practicals/tutorial/assignments :**

Sr. no	Practicals	Course outcomes
9	Identify PLC components	EEF506-1
10	Identify/handle PLC input/output modules.	EEF506-2
11	Identify/handle devices to which PLC input/output modules are connected	EEF506-3
12	Programming ON-off inputs to produce On-off outputs	EEF506-4

13	Creating at least 3 ladder diagrams from simple process descriptions.	EEF506-4
14	Simulate at least three simple different operations on PLC kit.	EEF506-4
15	Trouble shoot any two conditions.	EEF506-5

**C: INDUSTRY EXPOSURE**

Visit to industry utilizing automation system and prepare report in a group of 4-5 students separately.

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) Industrial visits.
- 5) Models.
- 6) Books:

Sr.no	Author	Title	Publisher
1	Gary Dunning	Introduction to PLC	Thompson Publication
2	John W. Webb, Ronald A. Reis.	Programmable logic controllers; principles and applications	Eastern Economy edition
3	A. K. Mukhopadhyay	Microprocessor and Microcontrollers and their applications	Narosa publications
4	V. R. Jadhav	Introduction to PLC	Khanna publications
5	Programmable logic controllers: programming methods and applications	John R. Hackworth, Frederick D. Hackworth Jr.	Pearson

**Course Name : ELEMENTS OF INDUSTRIAL AUTOMATION**  
**Course Code : EEF507**  
**Course Abbreviation : FEIA**

**Teaching and evaluation scheme :**

**Pre-requisite Course(s): EEF307, EEF402**

**Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination		Total
	Theory	Practical	Theory Examination	Term Work	
Details of Evaluation	Average of two tests of 20 marks each	i.25 marks for each practical ii.One PST of 50 marks	Term End Theory Exam (03 hours)	As per Proforma-III	
Marks	20	--	80	25	125

#### **RATIONALE:**

A diploma engineer has to look after the day-to-day operations, control and maintenance of controllers used in various automated industrial systems to ensure trouble free working. He should be well conversant with the various technical aspects of commonly used control components and control actions in respect of their working and performance. With the above knowledge, he should also be able to implement innovative ideas of automation wherever necessary.

Programmable Logic Controllers (PLC) have revolutionized and replaced the conventional industrial automation systems. A single PLC can reliably handle number of complex control actions in real time with high precision.

**COMPETENCY:** Maintain simple industrial automation systems.

Cognitive: Understand operations, control and maintenance of controllers used in various industrial automation systems.

Psychomotor: Carry out activities related to operation of simple industrial automation systems.

Affective : Attitude of i) safety ii) accuracy iii) precision and iv) aesthetic presentation

#### **COURSE OUTCOMES :**

- EEF507-1. Use architecture of industrial automation system.
- EEF507-2. Implement various industrial control components.
- EEF507-3. Use various industrial control actions
- EEF507-4. Handle the PLC.
- EEF507-5. Implement simple industrial controls.
- EEF507-6. Implement simple industrial automation 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, POs	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 Electrical equipment	PSO2 Electrical power systems
Competency: Maintain simple industrial automation systems.	2	2	3	3	1	–	–	3	2	3	3	2
EEF507-1 Use architecture of industrial automation systems	2	2	3	3	1	–	–	2	1	3	2	2
EEF507-2 Implement various industrial control components	2	1	3	3	1	–	–	3	2	3	3	2
EEF507-3. Use various industrial control actions	2	2	3	3	1	–	–	3	2	3	3	3
EEF507-4. Handle the PLC.	2	2	3	3	1	–	–	2	2	3	2	1
EEF507-5 Implement simple industrial controls.	2	3	3	3	–	–	–	3	2	3	3	2
EEF507-6 Implement simple industrial automation systems.	2	3	3	3	–	–	–	3	2	3	3	1

**A). CONTENT: THEORY:****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CO: EEF507-1. Use architecture of industrial automation systems.</i>			
01	Industrial Automation Industrial Automation and Control Architecture of Industrial Automation Systems	04	06
<i>CO: EEF507–2. Connect and use various industrial control components</i>			
02	Industrial Control Components Input devices (Basic working and schematic diagrams with functions) Definition of control devices such as Push buttons, selector switches. Solenoid valves, Limit switches and its types Pressure, temperature, flow, float actuated switches Reed switches, photoelectric, hall effect, inductive, capacitive proximity Switches Two wire and three wire control. Output devices (Basic working and schematic diagrams with function) NO/NC contacts Electromagnetic Relays, contactors and their ratings, solenoid valves Solid state Relays: Latching Relays, Bimetallic Thermal Over-load Relay,	12	20

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Time Delay Relays (Timers): Electronic Overload Relay Pneumatic cylinders Power and control wiring diagrams, main and auxiliary contacts Interlocking of contactor circuits using push buttons, NC contacts and limit switches. Schematic of symbols used in industrial control circuits		
<i>Course Outcome EEF507-3 Implement the industrial control actions</i>			
03	Industrial Control Actions Process control actions (block diagrams with very brief functioning descriptions) Proportional Controllers, Integral Controllers, Proportional-Integral Controllers, Derivative Controllers, Proportional-Integral-Derivative Controllers	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

<i>Course Outcome EEF507-4 Handle the PLC.</i>			
04	Programmable Logic Controller Block diagram and working of PLC, proximity sensors /switches; inductive and capacitive types: description with simple block diagrams; areas of applications, opto-isolators, optical sensors. PLC modules: digital I/O modules and their ratings, analog I/O modules and their ratings, timer/counter modules. Memories: ROM: types (Mask ROM, PROM, EPROM, EEPROM ) and RAM, functions. PLC power supplies block diagram and function of each block, PLC advantages and disadvantages.	10	18
<i>Course Outcome EEF507-5 Implement simple industrial controls.</i>			
05	Basic Components of PLC. Ladder diagrams Typical PLC inputs. Typical PLC Outputs. One contact, one coil circuit Standard start-stop-seal circuit Ladder diagrams for simple logic operations(NOT, AND, OR, EXOR) On delay timer, off delay timer Ladder diagrams for DOL, Star-delta (automatic) starters.	08	14
<i>Course Outcome EEF507-6 Implement simple industrial automation systems.</i>			



06	Implementation of automation: Electric Drives: Energy saving with adjustable speed drives, production control systems. Introduction to CNC Machines	06	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	Application		
1	Industrial Automation	00	02	04	EEF507-1	06
2	Industrial Control Components	04	04	12	EEF507-2	20
3	Industrial Control Actions	02	04	08	EEF507-3	14
4	Programmable Logic Controller	04	04	10	EEF507-4	18
5	Basic Components of PLC	02	04	08	EEF507-5	14
6	Implementation of automation.	00	02	06	EEF507-6	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.

### 3) TERM WORK

Practical Exercises and related skills to be developed :

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
01	Identification of automation components.	Recognize the components	EEF507-1
02	Operation of different switches in automation	Connect different switches	EEF507-2
03	Develop 2 wire control scheme.	Connect different switches and relevant components.	EEF507-2
04	Develop 3 wire control scheme.	Connect different switches and relevant components.	EEF507-2
05	Develop and connect interlocking circuits for contactors.	Connect different contactor interlocking components.	EEF507-2
06	Identify and connect the modules.	Identify the different modules of PLC and connect them.	EEF507-4
07	Prepare ladder diagram and implement it for DOL and star-delta starters.	Working with ladder diagrams to implement them.	EEF507-5
08	Operate any one type of electric drive (such as VFD, VVVF drives etc.) used in automation.	Connecting the drives in relevant positions of automation systems	EEF507-6

### 4) INDUSTRIAL EXPOSURE :

At least two industrial visits to be conducted.

### ASSESSMENT CRITERIA FOR TERM WORK AND PRACTICAL EXAMINATION

Assessment Criteria for Term work :

## i) Continuous Assessment of Practical Assignments :

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

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

One progressive skill test will conducted and marks will be awarded as per above criteria.

## 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 Banks

## REFERENCE MATERIAL :

a) Books / Journals / IS Codes

Sr. No.	Author	Title	Publisher
1	Eshwar U. S.	Handbook of Electric Motor Controls	Tata McGraw Hill
2	Bhattacharya & Singh	Control of Electrical Machines	New Age International Publishers
3	T. A. Hughes:	Programmable Controllers.	
4	John Webb:	Programmable Logic Controllers Principles and applications	Prentice Hall India
5	Bryan & Bryan	Programmable Controllers Theory and Implementation	An Industrial Text Company Publication

CDs, PPTs, Models, Charts etc: Teachers must use educational software such as that available on the internet (eg. TRiLOGI, SIEMENS etc) for the PLC.

Websites:

1. [www.brothersoft.com/download/plc-simulator](http://www.brothersoft.com/download/plc-simulator),
2. [www.edusoft.co.za/ladsim.htm](http://www.edusoft.co.za/ladsim.htm)

**Course ID :**

**Course Name** : Non Conventional Power Generation  
**Course Code** : EEF508  
**Course Abbreviation** : FNCG  
**Pre-requisites** : Nil

**Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	i) 50 marks for continuous assessment ii. One PST of 50 marks	Term End Theory Exam (03 hours)	-	As per Performa	
Marks	20	-	80	25	-	125

**Rationale:**

Energy is an important aspect in all sectors of country's economy. The energy crisis is mainly caused due to increased population and enhanced standard of living and life style of people. The conventional sources of energy are insufficient to meet these demands. Hence, alternative energy sources are utilized for power production. The use of alternate energy sources is increasing day by day. Diploma engineers are expected to develop, operate and maintain these systems. It is therefore essential to know basics of energy conversion, conservation, and energy audit and waste heat recovery techniques.

**Course Competency** : Identify & suggest appropriate non conventional energy use techniques.

**Course Outcomes**

- EEF508-1. Apply solar technologies for heating & generating electric energy
- EEF508-2. Maintain wind energy conversion systems .
- EEF508-3. Use bio-mass energy conversion systems.
- EEF508-4. Use ocean energy conversion systems.
- EEF508-5. Use alternate energy source

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

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	PSO1 Electrical equipment	PSO2 Electric power systems
Identify & Suggest appropriate non conventional energy use techniques	3	3	3	3	3	3	2	1	1	3	3	3
EEF508 -1 Apply solar technologies for heating & generating electric energy.	3	2	3	-	2	3	3	2	2	3	3	3
EEF508-2 Maintain wind energy conversion systems.	3	3	3	2	2	1	1	2	1	3	3	2
EEF508-3 Use bio-mass energy conversion systems.	3	1	2	2	2	3	2	2	2	3	3	3
EEF508-4 Use Ocean energy conversion systems.	3	3	3	3	2	2	2	4	1	2	4	3
EEF508-5 Use alternate energy source	3	3	3	3	3	2	2	1	1	2	3	2

**Contents:****A) Theory****Section I**

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
1) CO: Apply solar technologies for heating & generating electric energy .			
1	<b>SOLAR ENERGY</b>  1.1 Major Sources of Energy: Renewable and Non-renewable. 1.2 Need and Prospectus of Alternate Energy Sources 1.3 Principle of conversion of solar radiation into Heat and Electricity. 1.4 Solar radiation Geometry: Declination, hour Angle, Altitude angle, incident angle, Zenith angle, solar Azimuth angle 1.5 Instruments for measuring solar radiation. 1.6 Construction and working of typical flat plate collector, solar concentrating collector and their applications, Advantages and Limitations 1.7 Space Heating and Cooling 1.8 Solar Photo voltaic Electric Conversion 1.9 Solar pond, solar electric power generation, Solar Distillation, Solar cooking and furnace 1.10 Solar pumping and Green House	14	22
2) CO: Maintain wind energy conversion systems			

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
2	<b>WIND ENERGY</b> 2.1 Principle of Wind energy conversion, Nature of the wind energy. 2.2 Power in wind, Power coefficient, Maximum power, Forces on the blades, Wind Energy Conversion 2.3 Selection of site for wind mill. 2.4 Classification of WEC systems. 2.5 Advantages and limitations of WECS 2.6 Basic components of WECS. 2.7 Wind energy collectors- Horizontal and Vertical axis machines, 2.8 Safety systems and Environmental aspects	10	18

## Section –II

Sr. no.	Topics/Subtopics	Teaching (Hours)	Theory evaluation Marks
3) CO: Use bio-mass energy conversion systems.			
3	<b>BIO-MASS ENERGY</b> 3.1 Biomass conversion technologies – 1) combustion 2) Thermo chemical 3) Biochemical - Wet processes, Dry processes. 3.2 Biogas generation – anaerobic digestion, 3.3 Types of Bio-gas plants a) KVIC Digester, fixed dome b) digester, c) Deenbhandu, Pragati Biogas plant. 3.4 Materials used for biogas generation. 3.5 Selection of site for biogas plant. 3.5 Energy plantation 3.6 Applications. Energy plantation	8	12
4) CO: Use ocean energy conversion systems.			
4	<b>ENERGY FROM THE OCEANS</b> 4.1 Ocean Thermal Electric Conversion-Methods of Power Generation, Open and closed cycle OTEC system 4.2 Tidal power –Basic Principle, Components of Tidal Power Plants, 4.3 Operation Methods-single basin and double basin 4.4 Advantages and limitations for tidal power Generation 4.5 Sites Requirements 4.6 Prospects of tidal energy in India	08	12
5) CO: Use alternate energy source			

5	<b>OTHER ALTERNATE SOURCES OF ENERGY</b> 5.1 Geothermal Energy –Sources, Principle, Hydrothermal Resources ,Geothermal energy power plant, Advantages Limitation and application of Geothermal Energy, Geothermal occurrence in India 5.2 Small Hydroelectric Plant(Mini and Micro hydel) Nature, Classification of SHP station, Components of SHP, Design Consideration for Mini and Micro Hydel Projects, Advantages and Limitation of SHP 5.3 Fuel Cell- Principle of Operation, Classification, Advantages, Limitation and Application of Fuel cell 5.4 Magneto-Hydro Dynamic(MHD) Power Generation- Principles, MHD system, Advantages, Future Prospects	08	16
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Specification table for setting question paper for semester end theory examination

Topic No.	Name of topic	Distribution of marks			Total marks
		Knowledge	Comprehension	Application	
1	Solar Energy	10	04	06	22
2	Wind Energy	04	04	04	18
3	Bio-Mass Energy	04	02	02	12
4	Energy From the Oceans	02	04	02	12
5	Other Alternate Sources of Energy	08	04	04	16
	Total >>	32	22	26	80

B: Practical works:

Sr. no	Practical experiences
1	To collect information about global and Indian energy market.
2	To study on solar flat plate collector used for water heating.
3	To study construction and working of photo voltaic cell.
4	To study construction, working of solar cooker
5	Visit to solar heating system/ wind power plant.
6	To study construction and working of horizontal axis wind mill or to visit a nearest wind farm.
7	To study construction and working of a biomass/ biogas plant or visit a biomass/ biogas plant of municipal waste or elsewhere..

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
	Total	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.

## a) Books

Sr. No.	Author	Title	Publisher
1.	Dr B.H.Khan	Non conventional energy Resources	Tata McGraw Hill
2.	G. D. Rai	Non conventional energy sources	Khanna publication
3.	S. P. Sukhatme	Solar energy	Tata McGraw Hill
4.	H. P. Garg	Solar energy	Tata McGraw Hill
5.	Arora	Power plant engineering	Dhanpat Rai & Co.
6.	Arora and Domkundwar	Power plant engineering	Dhanpat Rai & Co.
7	P.H. Henderson	India- The energy sector	Oxford University Press
8	D. A. Ray	Industrial energy conservation	Pergaman Press
9	W. C. Turner	Energy management handbook	Wiley Press

- b) Websites i) [www.mahaurja.com](http://www.mahaurja.com) ii) [www.indiasolar.com](http://www.indiasolar.com) iii) [www.beeindia.in](http://www.beeindia.in)

**Course ID :**

**Course Name** : Electrical Sub-Station Practices and Maintenance.  
**Course code** : EEF 509  
**Course Abbreviation** : FSPM  
**Pre-requisites** : EEF403

**Teaching Scheme and Evaluation Scheme :****Teaching Scheme:**

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

**Evaluation Scheme:**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical Examination (Internal)	
Details of Evaluation	Average of two tests of 20 marks each	i) 50 marks for each practical ii) One PST of 50 marks	Term End Theory Exam (03 hours)	As per Proforma -III	--	
Marks	20	--	80	25	-----	125

**Rationale :**

A Diploma Engineer employed in the substations of Generation, Transmission and Distribution fields has to be conversant in the operation, control, working of power stations and sub-stations to maintain an uninterrupted power flow. He should be in a position to take decisions, Selection of electrical equipments as per specification, To follow standard installation procedures , Testing procedures, Monitoring and control actions in the substation. and maintenance work as per checklist procedures by keeping records for future references. The topics included are meant to prepare the technicians to carry out these responsibilities in day to day work.

**Course competency** : Operate and maintain substation equipment following safety practices.

**Cognitive** : Understand working of electrical sub-stations

**Psychomotor**: Operate substation equipments and devices.

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

**Course Outcomes :**

- EEF 509- 1: Prepare load prediction curve for load on substation.
- EEF 509- 2: Assist in economic operation of power substation.
- EEF 509- 3: Determine specifications and select equipments for substation.
- EEF 509- 4: Carry out maintenance of major equipments in substation.
- EEF 509- 5: Carry out maintenance of relays in substation..
- EEF 509- 6: Work as supervisor in the control room of substation.



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

[ Note : Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

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	PSO1 Electrical Equipment	PSO2 Electrical Power systems
Competency To Operate and maintain substation equipment following safety practices.	3	3	3	2	3	—	—	2	2	2	3	3
EEF509- 1To prepare load prediction curve for load on substation.	3	3	2	2	2	—	—	3	3	2	3	3
EEF509-2 Assist in economic operation of power substation.	3	3	3	3	2	—	—	3	3	3	3	2
EEF509-3 Determine specification and select equipments for substation	2	3	3	2	1	—	—	2	2	2	3	3
EEF509-4 Carry out maintenance of major equipments in substation.	3	3	1	2	3	—	—	2	2	2	1	2
EEF509-5 Carry out maintenance of relay in substation.	2	3	2	2	3	—	—	2	2	2	2	2
EEF509-6 Work as a supervisor in the control room of substation.	2	2	1	2	2	—	—	3	2	2	2	2

#### A] Course Content :

##### Section I

Sr. No.	Topics/sub-topics	Teaching (Hours)	Theory Marks
EEF 509-01 : Prepare load prediction curve for load on substation.			
1	Prediction Of Load, Choice Of Power Station And Selection Of Units 1.1 Type of loads 1.2 Load requirements of an area 1.3 Rural electrification 1.4 Forecasting of load and electrical energy requirements 1.5 Choice of size of generator units and number by considering load and load duration curves with Numerical problems 1.6 Operational schedule for the generator units according to load curves 1.7 Basic load and peak load stations 1.8 Effect of variable load on the power station operation and design	10	16
EEF 509-02: Assist in economic operation of power substation			
2	Economic Loading Of Power Stations 2.1 Methods of loading steam stations 2.2 Distribution of load between generator units in a power	6	12

Sr. No.	Topics/sub-topics	Teaching (Hours)	Theory Marks
	station. 2.3 Co-ordination of different types of power station for economic loading. 2.4 Limiting values of load factor for most economic operation.		
EEF 509-03: Determine specifications and select equipments for substation.			
3	Primary Sub-Station 3.1 Indoor and out-door types. 3.2 System of bus bar connections and arrangements. 3.3 Substation layout. 3.4 Selection of power transformers and their specifications. 3.5 Selection of circuit breakers and their specifications. 3.6 Current limiting reactors and methods. 3.7 Their location interlocking and indication systems.	8	12
TOTAL		24	40

## Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEF 509-04: Carry out maintenance of major equipments in substation.			
4	Testing, Installation and Maintenance of Sub-Station Equipments I] Testing and Installation of Sub-Station Equipments - 4.1 Short circuit testing of circuit breakers direct testing and Indirect testing. 4.2 Installation of power transformers. 4.3 Installation of outdoor circuit breakers. II] Maintenance of Sub-Station Equipments- 4.4 Inspection servicing examination and overhaul of substation equipment. 4.5 Guide lines for maintenance of switch-gear. 4.6 Maintenance of schedule. 4.7 Checklist. 4.8 Maintenance of dielectric oil. 4.9 Maintenance of air blast circuit breaker and compressed air plant.	12	20
EEF 509 – 05: Carry out maintenance of relays in substation..			
5	Testing and maintenance of relays 5.1 Importance of maintenance and setting of relays 5.2 Tests on relays 5.3 Routine maintenance tests 5.4 Test on CTs and PTs 5.5 inspection and testing for acceptance	8	12
EEF 509 – 06: Carryout control actions as supervisor in the control room of substation.			
6	Control room arrangement 6.1 General features of control boards 6.2 Control circuit wiring diagrams and markings	4	8
TOTAL		24	40

**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	Understand	Apply		
I / 1.	Prediction of load.	4	4	8	EEF 509-01	16
I / 2.	Economic loading.	4	4	4	EEF 509- 02	12
I / 3.	Design of primary substation.	4	4	4	EEF 509- 03	12
II /4.	Testing and installation of substation.	2	4	4	EEF 509 – 04	20
	Maintenance of substation.	2	4	4		
II/5.	Testing maintenance of relays.	4	4	4	EEF 509 – 05	12
II / 6.	Control room arrangement.	2	2	4	EEF 509 - 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.

**B] Term work:**

[ practical learning based on industrial site visits, assignments, group discussions and web search reports to develop relevant skills.]

Sr. no	Site experience reports	Skills developed	Course outcome
1	Power plant visit.	1] To identify the components of the plant its layout. 2] To appreciate Installation & commissioning procedures .	EEF509- 1
2	Visit to substation for understanding load distribution and control	load distribution controls in substations	EEF509-02
3	Visit to primary substations	Prepare layout of installation of Substation.	EEF509-03
4	Maintenance of substation equipments.	Prepare maintenance procedures & reports.	EEF 509-04
5	Use of CT/ PT, Current setting and time setting of over current induction type relay.	Relay setting..	EEF509- 05
6	Control room/ load dispatch centre visit	Actions in the Control room/ load dispatch centre ( Report to be prepared)	EEF 509 - 06

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

Sr. no	Criteria	Marks allotted
1	Attendance	10
2	Preparedness	10
3	Use of data tables/sheets/logbooks	10
4	Report writing	20
		50

**Instructional strategies:**

- 1) Lectures and discussions.
- 2) Industrial visits.
- 3) Time bound assignments.

**Teaching and Learning resources, including references:**

- 1) Chalk-board.
- 2) Demonstrative kits.
- 3) Demonstrative charts.

**Ref. Books:**

1. Elements of Electrical Power Station Design: - M. V. Deshpande, (Wheeler Publication)
2. Power Stations & Sub-stations:- L. Bapitdanev & Tarasov.
3. Switchgear & Protection: - Sunil S. Rao.
4. EHV Substation & Equipment: - N. P. Bhournick, B. Bhattacharya.

**Criteria for assessment of Oral at semester end exam:**

Covering the curriculum, ten questions at varied levels (Knowledge and understanding) will be asked each carrying 10% of the total marks. One to Two sub-questions under each main question may also be asked to ascertain the depth of learning & marks awarded there off As per Pro-forma II.

**Course ID :**

**Course Name** : Advanced Solar and Wind Power Technologies  
**Course Code** : EEF510  
**Course Abbreviation** : FASW

**Teaching and evaluation scheme :**

**Pre-requisite Course(s)** : EEF306

**Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination		Total
	Theory	Practical	Theory Examination	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 :**

The electrical energy generation now a day is a blend of different types such as hydro, thermal, wind and solar etc. the wind and solar power generation technologies are gaining a huge ground and becoming more popular. India being a tropical country is blessed with very large number of solar days when ample solar energy is available. Hence it is needed to harness it to reduce the pressure on the conventional energy resources used for electricity generation. The same is the case with wind power. This course aims to imbibe the skills of handling the wind and solar plants as a technician.

**Competency**

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences

- Maintain solar and wind power plants.  
 Cognitive : Understand the working of solar and wind power plants  
 Psychomotor : i) Operate and maintain solar and wind power plants  
 Affective : Attitude of i) safety ii) accuracy iii) precision iv) aesthetic presentation

**Course outcomes (COs)**

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency.

EEF510-1. Identify the parts of different solar systems.

EEF510-2. Maintain solar PV systems.

EEF510-3. Identify the parts of small and large wind turbines.

EEF510-4. Diagnose major electrical faults and its remedies.

EEF510-5. Maintain small wind turbines.

**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
Competency: Maintain solar and wind power plants	3	3	3	2	1	1	—	2	1	2	3	2
EEF510-1: Select components for off-grid solar domestic PV systems	3	3	2	2	1	1	—	2	2	2	2	2
EEF510-2: Assemble solar PV systems.	2	2	3	2	1	1	—	2	1	2	3	2
EEF510-3: Install solar PV off grid small capacity systems	2	3	3	2	1	2	—	2	1	2	3	2
EEF510-4: Maintain solar water heating /lighting systems	2	3	3	2	1	2	—	2	1	2	3	2
EEF510-5: Maintain electrical sub assemblies wind mills.	2	3	3	2	1	1	—	2	1	2	3	2

Content :

A) Theory :

**Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEF510-1. <i>Identify the parts of different solar power systems.</i>			
1	Solar energy conversion Renewable energy sources: Energy scenario in India. Types of solar systems: solar heating systems, solar PV systems, concentrated solar power (CSP) systems Photovoltaic cell: Construction, Types Specifications: Typical specifications of solar cells like $V_{OC}$ , $I_{SC}$ , $W_{peak}$ Solar thermal power conversion: Working principle, types and their block diagram. Low temperature solar energy applications: Domestic water and space heating systems	12	20
EEF510-2. <i>Maintain solar PV systems.</i>			
2.	Solar PV power plants Solar PV panels: Series and parallel connections of solar modules. Performance: Influencing factors: tilt angle, solar radiation, I-V, P-V characteristics, maximum power point tracking (MPPT), and conversion efficiency. DC-DC and DC-AC solar PV plants: Load estimation and selection of suitable solar panels, charge controller, batteries, switchgear and cables. On-grid solar PV systems: Working principle of grid-tied dc-ac inverter, grid synchronization and active power export. Net metering: main features.	12	20

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Economics, potential and environmental impact : domestic active solar water heating, passive solar heating and day lighting ,		
	Total	24	40

## Section II

EEF510-3. <i>Identify the parts of small and large wind turbine.</i>			
3	Wind power technology 3.1 Energy in the wind, wind power density, wind maps. 3.2 Vertical axis and horizontal axis small wind turbines. 3.3 Drag and lift principle of working. 3.4 Power curves of wind turbines, MPPT. 3.5 Parts of large wind turbine. 3.6 Aerodynamic control: Stall, pitch and active stall control of wind turbines. 3.7 Environmental impact.	08	14
EEF510-4. <i>Diagnose major electrical faults and its remedies.</i>			
4	Components of wind power plants Electrical generators in small wind turbines: permanent magnet synchronous generators, induction generators Electrical generators in large wind turbines: Squirrel-Cage rotor Induction Generator, Wound-Rotor Induction Generator, Doubly-Fed Induction Generator, Synchronous Generator Power electronic converters in different types of wind turbines, Common electrical faults in small and large wind turbines	08	14
EEF510-5. <i>Maintain solar and wind power systems</i>			
5	Common faults in small and large wind turbines. Routine Small wind turbine maintenance procedures Maintenance of roof top and streetlight solar PV systems Elements of wind solar hybrid system	08	12
	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	Identify the parts of different solar systems.	02	06	12	EEF510-1	20
2	Maintain solar PV systems	02	06	12	EEF510-2	20
3	Identify the parts of small and large wind turbine	02	04	08	EEF510-3	14
4	Diagnose major electrical faults and its remedies	02	04	08	EEF510-4	14
5	Maintain solar and wind power systems	02	04	06	EEF510-5	12

## B) Term Work

Practical Exercises and related skills to be developed :

The following practical exercises shall be conducted (any ten):

Sr. No.	Practical Exercises (Learning Outcomes to be achieved through practicals)	Course outcome
01	Identify different types of solar power systems	EEF510-1
02	Identify different components of PV solar systems	EEF510-2
03	Video show on assembly of a solar off grid PV system (DC-DC)	EEF510-2
04	Video show on assembly solar off grid PV system (DC-AC).	EEF510-2
05	Video show on assembly solar PV system with smart metering.	EEF510-2
06	Test solar PV panel.	EEF510-2,4
07	Test solar PV system.	EEF510-2,4
08	Test DC-DC solar PV system.	EEF510-2,4
09	Test DC-AC off-grid solar PV system.	EEF510-2,4
11	Troubleshoot the solar PV system (DC-DC and DC-AC)	EEF510-4
12	Identify the parts of a direct drive and geared small wind turbine	EEF510-3,5
13	Study direct drive small wind turbine	EEF510-3,5
14	Study geared small wind turbine	EEF510-3,5
15	Identify major parts of a large wind turbine	EEF510-3,5
16	Check the electrical performance of wind power system	EEF510-3,5
17	Check the performance of direct drive small wind turbines	EEF510-3,5
18	Check the performance of geared small wind turbines	EEF510-3,5

Industrial exposure :

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

## C) Assessment criteria for term work and practical examination

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*.

## D) Instructional strategies :

1. Lectures cum Demonstrations
2. Classroom practices

Teaching and Learning resources :

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



## E) Reference material :a) Books / Journals / IS Codes

S. No.	Title of Book	Author	Publication
1	Solar Photovoltaic Technology And Systems - A Manual For Technicians, Trainers And Engineers	Solanki, Chetan Singh	Prentice Hall India (PHI) learning ISBN: 9788120347113
2	Non-conventional energy sources and utilization	Rajput, R.K.	S.Chand and company Pvt. Ltd. ISBN:9788121939713
3	Wind Electrical Systems	Bhadra, S.N., Kastha, D., Banerjee, S.	Oxford University Press ISBN: 9780195670936
4	Wind Power Technology	Joshua Earnest	Prentice Hall India (PHI) learning ISBN: 9788120347786

## F) Websites

- a. [www.mnre.gov.in](http://www.mnre.gov.in)
- b. [www.mahaurja.com](http://www.mahaurja.com)
- c. [www.solarmango.com](http://www.solarmango.com)
- d. [www.ireda.gov.in](http://www.ireda.gov.in)
- e. [www.seci.gov.in](http://www.seci.gov.in)
- f. [www.mahadiscom.in/SolarRoofTopNetMetering.shtm](http://www.mahadiscom.in/SolarRoofTopNetMetering.shtm)
- g. [www.indianwindpower.com/](http://www.indianwindpower.com/)

\* \* \*

**Course ID :**

**Course Name** : Electrical Design Fundamentals  
**Course Abbreviation** : FEDE  
**Course Code** : EEF 511  
**Pre-requisites** : EEF305.

**Teaching Scheme and Evaluation Scheme:****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	3	5
Practical	2	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination			Total
	Theory	Practical	Theory Examination	Term Work	Practical 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-III		
Marks	20	--	80	25	----	125

\* Assessment as per Pro-forma III which includes marks of continuous assessment, progressive skill tests and term end oral

**Rationale:**

A diploma in electrical engg student is sometimes called upon to design and make Magnetic coils used for various applications e.g. Small transformer, Contactor coils, choke coil etc. Related to this the topics involved in course to make calculations for design of magnetic coils, and Magnetic circuit designs for single phase transformer, and induction motor.

**Course Outcomes:** To design efficient machines like single and three phase Induction motor and transformer or coils with optimum economy.

**Cognitive** : Understanding and applying principles of electrical machine design.

**Psychomotor** : To make calculations and design of electrical machines and magnetic coils.

**Affective** : Development of attitude of i) safety ii) accuracy iii) precision iv) punctuality v) Aesthetic presentation.

**Course Outcomes:**

**EEF 511-1:** Design of magnetic coil.

**EEF 511-2:** Design small single phase transformer.

**EEF 511-3:** Design single phase transformers.

**EEF 511-4:** Carry out cooling systems calculations for single phase and three phase transformer.

**EEF 511-5:** Design three phase induction motor up to 20 HP.

**EEF 511-6:** Design single phase induction motors..

**Mapping of CO's and PO's : Competency, course outcomes and programme outcomes/ programme specific outcomes** (cp-co-po/ps) matrix[ Note : Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

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	PSO1 Electrical Equipment	PSO2 Electrical Power systems
Competency: To design efficient machines like single and three phase Induction motor and transformer or coils with optimum economy.	3	3	3	3	3	—	—	3	2	3	3	3
<b>EEF 511-1:</b> Design magnetic coils.	3	3	2	2	2	—	—	3	3	3	3	3
<b>EEF 511-2:</b> Design small single phase transformer.	3	3	3	3	2	—	—	3	3	3	3	2
<b>EEF 511-3:</b> Design of single phase transformers	2	3	3	3	2	—	—	2	2	2	3	3
<b>EEF 511-4:</b> Carry out cooling systems calculations for single phase and three phase transformer	3	3	3	3	2	—	—	2	2	3	2	2
<b>EEF 511-5:</b> Design of three phase induction motor up to 20 HP.	3	3	2	3	3	—	—	2	2	2	3	3
<b>EEF 511-6:</b> Design single phase induction motor.	2	2	3	3	2	—	—	3	2	3	3	3

**Course Content :**

**Section I**

Sr. no.	Topics / subtopics	Teaching (Hours)	Theory evaluation Marks
<b>EEF 511-1:</b> Design and fabricate magnetic coils.			
1	Design of magnet coils 1.1 Types of magnets 1.2 Construction of magnets 1.3 Design of magnet coil 1.4 Current capacity 1.5 Turns winding section 1.6 Temperature rise 1.7 Space factor 1.8 Design problems.	8	10
<b>EEF 511-2:</b> Design various types of small single phase transformer.			
2	Design of small transformers 2.1 Core design 2.2 Winding design 2.3 Window area 2.4 Design problems	8	15
<b>EEF 511-3:</b> Design single phase transformer.			

Sr. no.	Topics / subtopics	Teaching (Hours)	Theory evaluation Marks
<b>EEF 511-1:</b> Design and fabricate magnetic coils.			
1	Design of magnet coils 1.1 Types of magnets 1.2 Construction of magnets 1.3 Design of magnet coil 1.4 Current capacity 1.5 Turns winding section 1.6 Temperature rise 1.7 Space factor 1.8 Design problems.	8	10
<b>EEF 511-2:</b> Design various types of small single phase transformer.			
2	Design of small transformers 2.1 Core design 2.2 Winding design 2.3 Window area 2.4 Design problems	8	15
3	Design of single phase transformers 3.1 Magnetic loading. 3.2 Electrical loading. 3.3 Core construction. 3.4 Types of cores. 3.5 Advantages of using stepped Core over rectangular cores. 3.6 Limb section 3.7 Yoke construction 3.8 Output equation of 3 phase and single phase transformers 3.9 Design problems on single phase transformers.	8	15
		24	40

## Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
<b>EEF 511-4</b> Cooling systems calculations for single phase and three phase transformer.			
4	Cooling of transformers 4.1 Cooling systems. 4.2 Temperature rise in plane walled tanks 4.3 Transformer oil as a cooling medium. 4.4 Transformer tank and calculation of number of cooling tubes.	8	10
<b>EEF-511-5</b> Design three phase induction motor.[ Upto 20 HP]			
	Introduction to Design Of Induction Motor (3 Phase, Squirrel Cage) 5.1 Construction 5.2 Design considerations, Specific loading 5.3 Output equations 5.4 Choice of average flux density in the air gap 5.5 Choice of ampere conductors per meter 5.6 Efficiency and power factor-Main dimension design. Main dimensions design.	8	15
<b>EEF 511.6</b> Design single phase Induction motor of various types and ratings.			
6	Introduction to Design Of Single Phase Induction Motors 6.1 Types of motors 6.2 Starting characteristics.	8	15

	6.3 Construction 6.4 Output equation 6.5 Main dimensions 6.6 Relative size of single phase and three phase motors 6.7 Design of stator 6.8 Rotor design concept 6.9 Problems for the determination of main dimensions		
		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

Sec / Top no.	Name of topic	Distribution of marks cognitive base (level wise)			Course out- come	Total marks
		Remember	Understand	Application		
I/1	Design Of Magnet Coils	3	4	8	EEF 511-1	15
I/2	Design Of Small Transformers	2	4	4	EEF 511-2	10
I/3	Design Of Transformers (Single Phase )	3	4	8	EEF 511-3	15
II/1	Cooling Of Transformers	3	4	8	EEF 511-3	15
II/2	Design Of Single Phase Induction Motors	3	4	8	EEF 511-4	15
II/3	Design Of Induction Motor ( Three Phase, Sq. Cage )	2	4	4	EEF 511-6	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.

#### B] Term work :

Design practice and related skills developed. Based on Laboratory experiences, Drawing sheets, Assignments, Group discussions, Presentation and web search related skills development.

Sr. no	Laboratory experience Assignments Mini	Skills developed	Course outcome
1	Design of single phase magnet coil	1) Calculations of dimensions 2) Calculations of windings 3) Calculations of core 4) Calculations of cooling requirements. 5) Prepare design data sheet 6) Prepare drawings as per design	EEF 511-1
2	Design of small single phase transformer	1) Calculations of dimensions 2) Calculations of windings 3) Calculations of core 4) Prepare design data sheet 5) Prepare drawings as per design	EEF 511-2 and EEF 511-3

3	Perform design of single phase induction motors	1) Calculations of dimensions 2) Calculations of windings 3) Calculations of core stator and rotor. 4) Calculations of cooling requirements. 5) Prepare design data sheet 6) Prepare drawings as per design	EEF 511-4
4	Design of three phase induction motors	1) Calculations of dimensions 2) Calculations of windings 3) Calculations of core stator and rotor. 4) Calculations of cooling requirements. 5) Prepare design data sheet 6) Prepare drawings as per design	EEF 511-5

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

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	2.5
2	Preparedness for practical	2.5
3	Use of data tables	5
4	Calculations	5
5	Design data sheet	5
6	Report writing	5
		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) Chalk-board.
- 2) Demonstrative kits.
- 3) Demonstrative charts.
- 4) Models

Reference Books:

- a) Performance & Design of A.C. Machines - by M. G. Say.
- b) A Course in Electrical Machine Design - by A.K .Sawhney.
- c) Electrical Machine Design - by Balbir singh.

Criteria for assessment at semester end oral\* exam:

About five questions from any two design problems covered in the practice above will be asked with sub-questions if needed to help the students answer. Each will carry 5 marks and marks will be awarded there of. (\*Assessment at semester end practical exam as per Pro-forma II which includes marks of continuous assessment, progressive design assignment and term end oral).

**Course ID :**

**Course Name** : **Illumination Engineering**  
**Course Code** : **EEF512**  
**Course Abbreviation** : **FILM**  
**Pre-requisite Course(s)** : **EEF305**

**Teaching and evaluation scheme :****Teaching Scheme :**

Scheme component	Hours / week	Credits
Theory	03	05
Practical	02	

**Evaluation Scheme :**

Mode of Evaluation	Progressive Assessment		Term End Examination		Total
	Theory	Practical	Theory Examination	Term Work	
Details of Evaluation	Average of two tests of 20 marks each	25 marks for each practical One PST of 50 marks	Term End Theory Exam (03 hours)	As per Proforma-III	
Marks	20	--	80	25	125

**RATIONALE:** This course aims to arm the Electrical Diploma holders work as technicians/supervisors in illumination and its control systems. It also inculcates the skills needed to keep them abreast in these fields by life long learning

**Competency:** Designing and installing illumination systems as per requirement.

Cognitive : Understand the requirements of different types of illumination schemes.

Psychomotor : Install illumination systems as per needs.

Affective : Attitudes of i) safety ii) precision iii) aesthetic presentation iv) accuracy

**Course outcomes :**

EEF512 -1 Select lamps for illumination application

EEF512 -2 Prepare illumination schemes using relevant luminaries

EEF512 -3 Implement illumination control circuits

EEF512 -4 Prepare illumination scheme for outdoor applications

EEF512 -5 Prepare illumination scheme for interiors of occupancies

EEF512 -6 Implement illumination schemes for unusual applications

**Competency, course outcomes and programme outcomes (cp-co-po) matrix**

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

Competency and COs	PO 1 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 Electrical equipment	PSO2 Electrical power systems
Designing and installing illumination systems as per requirement	3	3	3	2	2	1	—	3	2	3	3	3
EEF512-1 Select lamps illumination application	3	3	2	3	2	1	—	3	2	2	2	2
EEF512-2 Prepare illumination schemes using relevant luminaries	3	3	3	3	2	1	—	3	2	2	2	2
EEF512-3 Implement illumination control circuits	2	3	3	3	2	1	—	3	3	3	3	2
EEF512-4 Prepare illumination scheme for outdoor applications	3	3	2	2	3	1	—	3	2	2	2	3
EEF512-5 Prepare illumination scheme for interiors of occupancies	3	3	2	3	3	1	—	3	2	2	3	2
EEF512-6 Implement illumination schemes for unusual applications	3	2	3	3	2	1	—	3	2	2	2	3

**Content :****A] Theory :****Section I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CO: EEF512-1</i> Select lamps for illumination application.			
1	Components Of Illumination Illumination terminology including luminous efficacy, CRT(Color Reference temperature ) CRI (Color Rendering Index) ,THD (Total Harmonic Distortion) & other terms, Laws of Illumination (Simple numerical ), Features of good Illumination scheme,Lamps Electromagnetic radiations: Visible light , Ultraviolet light, Infrared light Types of lamps: (Construction & working) Incandescent lamp, ARC lamps, Fluorescent lamp, Mercury vapour lamp, Sodium vapour lamp, Neon lamp, Neon Sign Tubes, Halogen lamp, CFL Lamps, Metal halides lamp, LED lamps, Induction Lamp, Special purpose lamps	12 (03)       (09)	16 (06)       (10)



Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CO: EE512-2 Prepare illumination schemes using relevant luminaries.</i>			
2	Lighting schemes: selection of lamps, Overvoltage & under voltage cut off ,Surge protection & power consumption Direct & Indirect Semi direct & semi indirect General lighting scheme Lighting calculation methods Watt /square meter method Lumens or light flux method Point to point method (Simple numerical)	6	12
<i>Course Outcome EE512-3 Implement illumination control circuits.</i>			
3	Illumination Control Purpose of lighting control Dimmers : Resistance type dimmer ,Salt water dimmer, Dimmer Transformers: Auto transformer, Two winding transformer dimmer Electronic Dimmers : Thyristor &Triac operated , Control of Enhanced Lighting Automatic Light controls	06	12
	Total	24	40

## Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>Course Outcome EE512 -4 Prepare illumination scheme for outdoor applications.</i>			
4	Illumination for Outdoor Applications Factory, Street, Flood Lighting, Railway platform, Lighting for Advertisement/Hoardings, Sports, Landscape Simple numerical based on design of simple schemes	10	14
<i>Course OutcomeEE512 -5 Prepare illumination scheme for interiors of occupancies.</i>			
5	Illumination for Interior Applications Standards for various situations in Interior Illumination Methods for Designing illumination schemes Design considerations for Interior location of Residential Commercial, Industrial premises Design Illumination scheme for different Interior locations of Residential, Commercial, Industrial unit lighting objective flow diagram	07	14
<i>Course OutcomeEE512 -5 Prepare illumination schemes for unusual applications.</i>			
06	Lighting for Special Applications Lighting schemes and general requirements for : Agricultural & Horticultural applications Health Care Centers and Hospitals Decorative lighting Stage lighting Aquariums & Shipyards	07	12

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	Total	24	40

**B] 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	Components Of Illumination	02	04	10	EEF512-1	16
2	Lighting schemes	00	04	08	EEF512-2	12
3	Illumination Control	04	04	04	EEF512-3	12
4	Illumination for Outdoor Applications	02	04	08	EEF512-4	14
5	Illumination for Interior Applications	02	04	08	EEF512-5	14
6	Lighting for Special Applications	02	04	06	EEF512-5	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.

**C] 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 Illumination Engineering* 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	Measure illumination by luxmeter for different locations.	Measuring the illumination	EEF512-1
2-3	(Any 02)	Collect technical data of lamps and lighting accessories	EEF512-2
	1. Prepare a report on Market survey for various lighting accessories.	Differentiate between the various types of lamps.	EEF512-2
	2. Study the different lighting accessories and lamps & their working	Select controlling methods of brightness/colour of light source as per requirements	EEF512-3
	3. Assignment to draw a control circuits for different situations as per requirement		
4	(Any 03)	Locate specific mountings of lighting sources for outdoor applications	EEF512-4
	1. Design Flood Lighting scheme	Selection & disposition of relevant light sources	EEF512-4
	2. Design an Illumination scheme for a garden of medium size	Selection & disposition of relevant light sources	EEF512-4
	3. Design an Illumination scheme for street lighting		

	4.Design an Illumination scheme for railway lighting	Selection & disposition of relevant light sources	EEF512-4
5	(Any05)	Selection & disposition of relevant light sources	EEF512-5
	1.Design Illumination scheme for Residential Installation		
	2. Design Illumination scheme for Commercial Installation	Calculate total lux level required for the working plane Selection & disposition of relevant light sources	EEF512-5
	3.Design Illumination scheme for Industrial Installation	Calculate total lux level required for the working plane Selection & disposition of relevant light sources	EEF512-5
	4. Design an Illumination scheme for a conference room of medium size.	Calculate total lux level required for the working plane Selection & disposition of relevant light sources	EEF512-5
	5.Design an Illumination scheme for a workshop for fine work of medium size..	Calculate total lux level required for the working plane Selection & disposition of relevant light sources	EEF512-5
	6.Design an Illumination scheme for a medium size Hotel / Hospital /Shopping complex	Calculate total lux level required for the working plane Selection & disposition of relevant light sources	EEF512-5
	7.Design an Illumination scheme for a workshop for fine work of medium size..	Calculate total lux level required for the working plane Selection & disposition of relevant light sources	EEF512-5

**D] Industrial Exposure :**(Included in *Laboratory Manual for Illumination engineering*)

Industrial Visits to field works for above topic.

**E] Assessment Criteria For Term Work And Practical Examination**

Assessment Criteria for Term work :

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

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

**ii) Progressive Skill Test :**One mid-term *Progressive Skill Test* of 50 marks shall be conducted as per criteria given in *Laboratory Manual for Illumination Engineering*

Domain	Particulars	Marks out of 50
Cognitive	Understanding	10
	Application	10
Psychomotor	Operating Skills	10
	Drawing / drafting skills	10
Affective	Discipline and punctuality	10
TOTAL		50

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

**F] 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
01.	N. V. Suryanarayana	Utilisation of Electrical Power	Wiley Eastern Limited
02.	Jack I. Lindsey	Applied Illumination Engineering	The Fairmont Press Inc.
03.	R.H. Simons & Robart Bean	Lighting Engineering: Applied Calculations	Architectural Press (ISBN 0750650516)
04.	Casimer M Decusatis	Handbook of Applied Photometry	Springer (ISBN 1563964163)
05	AnilValia	Designing with light: Lighting Handbook	Lighting System2002
06	Gary Gorden,; John Wiley& SonsInc	Interior Lighting for Designers	
07	M A.Cayless and A.M.Marsden; Edward Arnold	Lamps and Lighting	
08	M.Schiler;JohnWiley&SonsInc.	Simplified Design for Building Lighting	

IS/International Codes : ISO, IS, BS standards, Data Sheets, IE Rules Handbook ,IS 2418, 9974, 9900, 2218, 5077, 4012, 4013, 1885, 1947, 4347, 6665, 3287, 1777, 3646, 2672, 10894, 1944, 10322, 2140

**Websites:**

[www.onlinefreebooks.net](http://www.onlinefreebooks.net)

[www.ies.org/shop/](http://www.ies.org/shop/)

[www.opticalres.com/lt/illuminationfund.pdf](http://www.opticalres.com/lt/illuminationfund.pdf)

**COURSE ID :**

Course Name : Industrial Organization And Management  
 Course Code : CCF501 / EEF513  
 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	i. 25 marks for each practical ii. One PST of 25 marks	Term End Online Theory Exam	-	
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**

The aim of this course is to improve management ability of individual through teaching.

**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 :**

The theory associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

CCF501-1/EEF513.1 Apply principles of management and carry out various functions of management.

CCF501-2/EEF513.2 Prepare organization structure for small and medium scale industry.

CCF501-3/EEF513.3 Perform duties of stores in-charge and materials manager.

CCF501-4/EEF513.4 Practice industrial safety rules, codes, practices and acts.

CCF501-5/EEF513.5 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
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	-	-
CCF501.3 Perform duties of stores in-charge, material and finance manager.	2	2	1	1	-	-	1	3	2	2	2	2
CCF501.4 Practice 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 :****A) THEORY :****SECTION -I**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CCF 501.1 Apply principles of management and carry out various functions of management.</i>			
<b>1</b>	<b>PRINCIPLES OF MANAGEMENT</b> 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	<b>06</b>	<b>10</b>
<b>2</b>	<b>FUNCTIONS OF MANAGEMENT</b> 2.1 Planning: Forms of planning, Strategic levels and Planning, Phases of Planning	<b>08</b>	<b>12</b>

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	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		
<b>3</b>	<b>HUMAN RESOURCE MANAGEMENT(Personnel Management)</b> 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	<b>06</b>	<b>10</b>
<i>CCF 501.2 Prepare organization structure for small and medium scale industry.</i>			
<b>4</b>	<b>FORMS OF BUSINESS ORGANISATION</b> 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.	<b>04</b>	<b>08</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

**SECTION II**

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>CCF 501.3Perform duties of stores in-charge, material and finance manager.</i>			
<b>5</b>	<b>MATERIALS MANAGEMENT</b> 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	<b>06</b>	<b>10</b>
<b>6</b>	<b>FINANCIAL MANAGEMENT</b> 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	<b>04</b>	<b>08</b>
<i>CCF 501.4 Practice industrial safety rules, codes, practices and acts.</i>			

<b>7</b>	<b>INDUSTRIAL ACT &amp; SAFETY</b> 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	<b>08</b>	<b>12</b>
<i>CCF 501.5 Apply various modern management techniques.</i>			
<b>8</b>	<b>MODERN MANAGEMENT TECHNIQUES</b> 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	<b>06</b>	<b>10</b>
	<b>Total</b>	<b>24</b>	<b>40</b>

**B) 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

**C) 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



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

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
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

**E) Websites**i) [nptel/iitm.ac.in](http://nptel/iitm.ac.in)ii) <http://iete.ac.in/subjects/amindustry/Mgmt.htm>

\* \* \*

**Course Id :****Course Name : MARKETING MANAGEMENT****Course Code : EEF 514****Course Abbreviation : FMKM****Pre-requisite Course(s) : NIL****Teaching and evaluation scheme :****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	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)	-	-	
Marks	20	--	80	-	-	100

**Rationale-**

The globalisation has lead to the requirement of multi-skilled personnel to execute the works and that too in a cost effective way. It is observed that the diploma holder in Engineering has wide spectrum for development, if he enters the marketing field. Provided he has the interest with proper initiative. Marketing now a day can provide fruitful employment to the diploma holder to make a career in marketing.

**Course Competency:**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

**Work as a marketing personnel for electrical components or business.**

**Cognitive:** understand the different techniques of marketing of products and services.

**Psychomotor:** Use the relevant techniques for marketing of industrial products.

**Affective:** Attitudes of i) honesty ii) aggressiveness.

**Course Outcomes:**

EEF514.1. Interpret different marketing techniques.

EEF514.2. Identify different types of markets.

EEF514.3. Carry out different marketing works/functions.

EEF514.4. Assist in marketing work of industrial products.

EEF514.5. Carry out market studies for products.

EEF514.6. Procure/devise proper advertising techniques for industrial products.

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

[ **Note : Correlation levels :** 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” : 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Work as marketing personnel for electrical components and business.	2	2	2	1	2	–	2	3	3	3	2	2
EEF514.1. Interpret different marketing techniques.	2	2	3	1	3	–	1	1	2	3	1	1
EEF514.2. Identify different types of markets.	3	2	2	1	2	–	2	1	2	2	1	1
EEF514.3. Carry out different marketing works/function	3	2	2	1	2	–	1	2	2	2	2	2
EEF514.4. Assist in marketing work of industrial products.	2	2	2	1	2	–	1	2	2	2	2	1
EEF514.5. Carry out market studies for products.	3	3	2	1	2	–	2	2	2	2	1	1
EEF514.6. Procure proper advertising agencies for industrial products.	2	2	1	2	1	–	2	2	2	1	1	1

### A) Contents:-

#### Section I

Sr.No	TOPICS Sub-Topics	Periods	Marks
	EEF514.1. Interpret different marketing techniques.		
1	<b>Marketing</b> 1.1 Meaning and significance of marketing 1.2 Marketing system 1.3 Concept of marketing 1.4 Product selling 1.5 Trends in modern marketing	10	15
	EEF514.2. Identify different types of markets.		
2	<b>Markets</b> 2.1 Meaning of market 2.2 Types of market 2.3 Government and industrial market	06	10
	EEF514.3. Carry out different marketing works/functions.		
3	<b>Functions &amp; Management</b> 3.1 Marketing functions 3.2 Meaning of marketing 3.3 Management and functioning 3.4 Types of marketing organizations 3.5 Marketing manager and his duties	08	15
	<b>Total</b>	24	40

## Section II

Sr.No.	TOPICS Sub-Topics	Periods	Marks
EEF514.4. Prepare scheme for marketing industrial products.			
4	<b>Marketing Industrial Products</b> 4.1 Types of industrial products 4.2 Characteristics and marketing considerations 4.3 Marketing planning 4.4 Product decision 4.5 Pricing decision	11	15
EEF514.5. Carry out market studies for products.			
5	<b>Strategies</b> 5.1 Marketing strategy 5.2 Marketing mix 5.3 Market survey 5.4 Market information systems 5.5 Buying behaviors	10	16
EEF514.6. Devise proper advertising techniques for industrial products.			
6	<b>Advertising</b> 6.1 Role of advertising in marketing 6.2 Marketing management without advertising 6.3 Brief introduction to cost component of advertising	03	09
<b>Total</b>		24	40

**B) Specification Table For Question Paper Of Theory Examination**

Topic No	Name Of Topic	Distribution of Marks (level wise)			CO	Total Marks
		Remember	Understand	Application		
1	Marketing	2	6	7	EEF514-1	15
2.	Markets	2	4	4	EEF514-2	10
3.	Marketing Functions & Management	4	5	6	EEF514-3	15
4.	Marketing Industrial Products	4	5	6	EEF514-4	15
5.	Strategies	4	6	6	EEF514-5	16
6.	Advertising	2	3	4	EEF514-6	09

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) Instructional Strategies:**

1. Lectures cum Discussions. 2. Regular Assignments for market surveys, feasibility, advertising. 3. Home Assignments. 4. Group Discussions, 5. Industrial Visits, 6. Lectures by marketing experts.

**D) Reference Books:**

- 1) Basic Marketing - by Cundiff & Still.
- 2) Marketing Management - by R. S. Davar.
- 3) Salesmanship, Sales Management & Advertising - by Satyanarayana.
- 4) Modern Marketing Management - by R. S. Davar.
- 5) Marketing Management (cases & Concepts) - by Dholakia, Khurana & Jain

**COURSE ID :****Course Name : PROJECT MANAGEMENT****Course Code : EE515****Course Abbreviation : FPRM****Pre-requisite Course(s): NIL****TEACHING AND EVALUATION SCHEME :****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	Oral Examination (External)	
Details of Evaluation	Average of two tests of 20 marks each	-	Term End Theory Exam (03 hours)	-	-	
Marks	20	--	80	-	-	100

**Rationale:**

A diploma holder in Electrical Engineering now a day finds himself entrusted with managing projects or part thereof. The age at which he/she is entrusted such responsibilities is declining day by day as a result of which he is stressed much and expected to perform well.

This course intends to introduce the elementary aspects of Scientific Project Management whose emphasis is on success, though everybody has his own style of managing projects successfully.

**COMPETENCY**

This aim of this course is to help the student to attain the following competency through various teaching learning experiences:

- **Use the principles of project management as a supervisor in relevant works.**

**Cognitive:** Understand the principles of project management.

**Psychomotor:** Carry out different functions/works related to projects.

**Affective:** Attitudes of i) safety ii) accuracy iii) aestheticism iv) .

**Course outcomes:**

EEF515.1. Identify project types and the tools/techniques used in it.

EEF515.2. Identify actions for project manager using computer based project management systems as well.

EEF515.3. Assist in establishing a project.

EEF515.4. Carry out project control activities.

EEF515.5. Implement projects using different techniques.

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

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" : 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	PSO1 Electrical Equipment	PSO2 Electrical power systems
Competency: Use the principles of project management as supervisor in relevant works.	2	1	1	1	1	—	1	3	3	3	2	3
EEF515.1. Identify project types and tools and techniques used.	2	2	3	1	3	—	1	1	2	3	2	3
EEF515.2. Identify actions for project manager using computer based project management systems as well.	2	2	2	1	2	—	2	1	2	2	2	3
EEF515.3. Assist in establishing a project.	2	2	2	1	2	—	1	2	2	2	2	3
EEF515.4. Carry out project control activities	2	2	2	1	2	—	1	2	2	2	2	3
EEF515.5. Implement projects using different techniques.	2	3	2	1	2	—	2	2	2	2	2	3

**Section I**

Sr. no.	Topics / subtopics	Teaching (Hours)	Theory Marks
EEF515.1. Identify the tools and techniques used in project management.			
1	<b>Project Management and its tools/techniques</b> 1.1 Idea of project 1.2 Characteristics of project 1.3 Categories of projects 1.4 Project life cycle phases (definition of each phase) 1.5 Project life cycle curve. Tools And Techniques For Project Management 1.6 Selection techniques 1.7 Execution planning and techniques 1.8 Scheduling and co-ordination techniques 1.9 Cost and productivity control techniques. 1.10 Communication and clean up techniques	12	20
EEF515.2. Identify actions for project manager using computer based project management systems as well.			
2	<b>Project Management System</b> 2.1 Block diagram with brief description , Computer based project management 2.2 Rationale behind computerized project management systems	12	20

Sr. no.	Topics / subtopics	Teaching (Hours)	Theory Marks
	<b>Project Management</b> 2.3 Need of project manager 2.4 Problems of project manager 2.5 Basic education for project manager 2.6 Roles and responsibilities of project management as a profession		
	Total	24	40

### Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Marks
EEF515.3. Work in a group to establish a project.			
3	<b>Establishing Project ( Scope &amp; Cost )</b> 3.1 Guidelines given by planning commission ( brief description about guidelines ) 3.2 Financing arrangements, capital cost, sources of financing 3.3 Internal and external sources 3.4 Terms of finance Short, intermediate and long term 3.5 Names of financial institutions with their mode of working in brief 3.6 Preparation of cost estimates types of estimates with very brief description: Order of magnitude, study estimate, preliminary estimate, Definitive estimate, detailed estimate.	6	10
EEF515.4. Carry out project control activities.			
4	<b>Project Activities And Profitability</b> 4.1 Project implementation schedule 4.2 Basis of time estimation 4.2.1 Time study 4.2.2 Previous project data 4.2.3 Estimates from the vendors/ contractors 4.2.4 Allocated time and committed time. Overall implementation schedule Bar chart Evaluation of project profitability methods 4.2.5 Pay-back period ( PBP ) return on investments ( ROI ) concept of zero date 4.3 Pre-project activities and advance actions ( very brief description )	9	14
EEF515.5. Implement project task using different techniques.			
5	<b>Implementation Control &amp; Monitoring</b> <b>Implementation</b> 5.1 Work breakdown structure 5.2 Project execution plan ( brief description ) Project procedure manual 5.3 Project control system	9	16

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Marks
	5.4 Need for flexibility 5.5 Project diary <b>Control &amp; Monitoring</b> 5.6 Direction reviews meeting creativity techniques such as questioning 5.7 Attribute listing 5.8 Brain Communications in a project feedback and forward 5.9 Unscheduled meetings and social get-togethers		
	Total	24	40

**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		
1.	Project Management and its tools/techniques	4	6	10	EEF 515-1	20
2.	Project Management System	4	6	10	EEF 515-2	20
3.	Establishing Project	2	4	4	EEF 515-3	10
4.	Project Activities And Profitability	2	4	8	EEF 515-4	14
5.	Implementation Control & Monitoring	2	6	8	EEF 515-5	16
	Total	14	26	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.

**Instructional strategies.**

- i) Lectures cum discussions.
- ii) Regular assignments.
- iii) Industrial Visits.
- iv) Group Discussions.

**References Books :-**

1. Project Management - by S. Choudhury (Tata McGraw Hill Pub.)
2. Project Management - A System Approach to planning, Scheduling & Controlling  
By Harold Kerzner (CBS Publishers & Distributors)