NOIDA INTERNATIONAL UNIVERSITY

EVALUATION SCHEME & SYLLABUS

For

UNDERGRADUATE DEGREE COURSE
IN

ELECTRICAL ENGINEERING

(Effective from the Session: 2019-20)

B. Tech in Electrical Engineering

Program Educational Objectives (PEOs)

The Department of Electrical Engineering has developed and maintained a well-defined set of educational objectives and desired program outcomes. Educational objectives of the program cater to the requirements of the stakeholders such as students, parents, employers, alumni, faculty etc. The program educational objectives are as follows:

- **PEO**1: Provide graduates with a strong foundation in mathematics, science and engineering fundamentals to enable them to devise and deliver efficient solutions to challenging problems in Electrical and allied disciplines.
- **PEO**2: Impart analytic and thinking skills to develop initiatives and innovative ideas for R&D, Industry and societal requirements.
- **PEO**3: Provide sound theoretical and practical knowledge of E&C Engineering, managerial and entrepreneurial skills to enable students to contribute to the well-being of society with a global outlook.
- **PEO**4: Inculcate qualities of teamwork as well as social, interpersonal and leadership skills and an ability to adapt to evolving professional environments in the domains of engineering and technology.
- **PEO**5: Motivate graduates to become good human beings and responsible citizens for the overall welfare of the society.

Program outcomes (POs)

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12**. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Credit System-Credit requirement for award of B.Tech:

- Every semester shall offer a minimum of **12 credits**.
- Credits for the Project or Thesis can vary from 10 to 15.
- The total number of credits for the B. tech Degree Course could vary from a **minimum of 158** credits to a **maximum of 178** credits.
- All courses of study put together would engage the students for a **minimum of 26 periods** or hours of study a week and a **maximum of 30 periods** or hours a week.

Under the Choice based credit system, which is a student or learner centric system, the courses of study in the B.Tech Degree course shall be as under:

a) Professional Core (PC) Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
b) Basic Sciences and Engineering Science (BS and ES) Course: A course which informs the Professional core and should compulsorily be studied.
c) Elective Course: Generally a course which can be chosen from a pool of courses and are of two types:
    (i) Professional Elective (PE) which may be very specific or specialized or advanced or supportive to the discipline or subject of study or which provides an extended scope
    (ii) Open Elective (OE) which enables an exposure to some other discipline or subject or domain or nurtures the candidate‘s proficiency or skill

The Weightage in terms of Credits for each of the above in the prescribed curriculum of the institution shall be as follows:

S.no.	Credit Breakups	Credits	Percentage
1	Humanities and Social Sciences including Management courses	12	
2	Basic Science courses	26	
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	20	
4	Professional core courses	52	
5	Professional Elective courses relevant to chosen specialization/branch	18	
6	Open subjects – Electives from other technical and /or emerging subjects	18	
7	Project work, seminar and internship in industry or elsewhere	12	
8	Mandatory Courses	0	
		*158	

**Minor variation is allowed as per need of the respective disciplines.*

While calculating credits the following guidelines shall be adopted, namely: -

- 1 Hr. Lecture (L) per week 1 credit
- 1 Hr. Tutorial (T) per week 1 credit
- 1 Hr. Practical (P) per week 0.5
- 2 Hours Practical (Lab)/week 1 credit

Credit distribution in each semester (158 credits to 8 semesters)

Semester	**Credits**		
	Theory	Practical	Total
1st/2nd	15	5.5	20.5
2nd/1st	12	5.5	17.5
3rd	25	2	27
4th	18	3	21
5th	18	3	21
6th	15	3	18
7th	12	4	16
8th	9	8	17
Total	110	48	158

Course coding system

Every course coded as follows:

BSC : Basic Science Courses
ESC : Engineering Science Course
MC : Mandatory Courses
HSMC : Humanities and Social Sciences including Management
EE : Program core courses
PEC : Program Elective courses
OEC : Open Elective courses

Seventh Semester

S. No	Course Code	Subject	Period			Evaluation Scheme					Total Credits
						Sessional Exam			End Exams	Subject Total	
			L	T	P	CA	TA	Total			
1	PEC-EE04	Program Elective – 4	3	0	0	20	20	40	60	100	3
2	PEC-EE05	Program Elective – 5	3	0	0	20	20	40	60	100	3
3	OEC-EE03	Open Elective-3	3	0	0	20	20	40	60	100	3
4	OEC-EE04	Open Elective-4	3	0	0	20	20	40	60	100	3
PRACTICALS											
1	PROJ-EE01	Project Stage-I	0	0	8	-	-	40	60	100	4
Total											**16**

Eight-Semester

S.No	Course Code	Subject	Period			Evaluation Scheme					Total Credits
						Sessional Exam			External Exam	Subject Total	
			L	T	P	CA	TA	Total			
1	PEC-EE06	Program Elective – 6	3	0	0	20	20	40	60	100	3
2	OEC-EE05	Open Elective-5	3	0	0	20	20	40	60	100	3
3	OEC-06	Open Elective-6	3	0	0	20	20	40	60	100	3
PROJECT											
1	PROJ-EE02	Project Stage-II	0	0	16			200	400	600	8
Total											**17**

PROFESSIONAL ELECTIVE COURSES [ELECTRICAL ENGINEERING]

S. No.	Course Code	Course Title	Hrs. /Week L: T: P	Credits
1	PEC-EE01	Non-conventional energy systems	3:0:0	3
2	PEC-EE02	Line Commutated and Active Rectifiers	3:0:0	3
3	PEC-EE03	Electrical Drives	3:0:0	3
4	PEC-EE04	Electrical and Hybrid Vehicles	3:0:0	3
5	PEC-EE05	Electrical Machine Design	3:0:0	3
6	PEC-EE06	Power System Protection	3:0:0	3
7	PEC-EE07	HVDC Transmission Systems	3:0:0	3
8	PEC-EE08	Power Quality and FACTS	3:0:0	3
9	PEC-EE09	High Voltage Engineering	3:0:0	3
10	PEC-EE10	Electrical Energy Conservation and Auditing	3:0:0	3
11	PEC-EE11	Industrial Electrical Systems	3:0:0	3
12	PEC-EE12	Power System Dynamics and Control	3:0:0	3
13	PEC-EE13	Digital Control Systems	3:0:0	3
14	PEC-EE14	Digital Signal Processing	3:0:0	3
15	PEC-EE15	Computer Architecture	3:0:0	3
16	PEC-EE16	Electromagnetic Waves	3:0:0	3
17	PEC-EE17	Computational Electromagnetics	3:0:0	3
18	PEC-EE18	Control Systems Design	3:0:0	3
19	PEC-EE19	Advanced Electric Drives	3:0:0	3

Sl. No	Code No.	Subject	Credits
01	OEC-EE01	Electronic Devices	3
02	OEC-EE02	Data Structures and Algorithms	3
03	OEC-EE03	Analog and Digital Communication	3
04	OEC-EE04	Computer Networks	3
05	OEC-EE05	Embedded Systems	3
06	OEC-EE06	VLSI circuits	3
07	OEC-EE07	Image Processing	3
08	OEC-EE08	Wavelet Transforms	3
09	OEC-EE09	Power Plant Engineering	3
10	OEC-EE10	Thermal and Fluid Engineering	3
11	OEC-EE11	Strength of Materials	3
12	OEC-EE12	Fluid Machinery	3
13	OEC-EE13	Automobile Engineering	3
14	OEC-EE14	Electrical Materials	3
15	OEC-EE15	Industrial Manufacturing Processes	3
16	OEC-EE16	Internet of Things	3
17	OEC-EE17	Big Data Analysis	3
18	OEC-EE18	Computer architecture	3

Course Code: PECEE-08 **Course Name:Power Quality and FACTS**
Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

1. Understand the characteristics of ac transmission and the effect of shunt and series reactive compensation.
2. Understand the working principles of FACTS devices and their operating characteristics.
3. Understand the basic concepts of power quality.
4. Understand the working principles of devices to improve power quality.

Course Description:

Understanding of the power quality problems. Knowledge about disturbance sources and their influence on the end users. Ability to perform in-situ measurements and practical skills to analyze measuring results. Proposing measures to improve power quality.

Course Contents:

Unit-I Transmission Lines and Series/Shunt Reactive Power Compensation

Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

Unit-II Thyristor-based Flexible AC Transmission Controllers (FACTS)

Description and Characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch. Configurations/Modes of Operation, Harmonics and control of SVC and TCSC. Fault Current Limiter..

Unit-III Voltage Source Converter based (FACTS) controllers

Voltage Source Converters (VSC): Six Pulse VSC, Multi-pulse and Multi-level Converters, Pulse-Width Modulation for VSCs. Selective Harmonic Elimination, Sinusoidal PWM and Space Vector Modulation. STATCOM: Principle of Operation, Reactive Power Control: Type I and Type II controllers, Static Synchronous Series Compensator (SSSC) and Unified Power Flow Controller (UPFC): Principle of Operation and Control. Working principle of Interphase Power Flow Controller. Other Devices: GTO Controlled Series Compensator. Fault Current Limiter.

Unit- Application of FACTS

Application of FACTS devices for power-flow control and stability improvement. Simulation example of power swing damping in a single-machine infinite bus system using a TCSC. Simulation example of voltage regulation of transmission mid-point voltage using a STATCOM.

Unit-V Power Quality Problems in Distribution Systems

Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement. Tolerance of Equipment: CBEMA curve.

Course Learning Outcomes(CLOs) :

Reliably identify the sources of various power quality problems.

- Explain about causes of harmonic and its distortion effect.
- Estimate the impact of various power quality problems on appliances.
- Educate the harmful effects of poor power quality and harmonics.
- Decide the compensators and filters to keep the power quality indices within the standards.

Text/References

1. N. G. Hingorani and L. Gyugyi, " Understanding FACTS: Concepts and Technology of FACTS Systems", Wiley-IEEE Press, 1999.
2. K. R. Padiyar, " FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
3. T. J. E. Miller, " Reactive Power Control in Electric Systems", John Wiley and Sons, New York, 1983.
4. R. C. Dugan, "Electrical Power Systems Quality" , McGraw Hill Education, 2012.
5. G. T. Heydt, "Electric Power Quality" , Stars in a Circle Publications, 1991

Online links for study & reference materials:

https://nptel.ac.in/courses/117/106/117106086/

Assessment method:(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PECEE-12 **Course Name: Power System Dynamics and Control**
Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

1. Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
2. Understand various components of industrial electrical systems.
3. Analyze and selectthe proper size of various electrical system components.

Course Description:

This **course** first introduces a student to **power** stability problems and the basic concepts of modeling and analysis of dynamical **systems**. Modeling of **power system** components - generators, transmission lines, excitation and prime mover controllers

Course Contents:

Unit- I Introduction to Power System Operations

Introduction to power system stability. Power System Operations and Control. Stability problems in Power System. Impact on Power System Operations and control.

Unit-IIAnalysis of Linear Dynamical System and Numerical Methods

Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability. Modal Analysis of Linear System. Analysisusing Numerical Integration Techniques. Issues in Modeling: Slow and Fast Transients, Stiff System.

Unit-IIIModeling of Synchronous Machines and Associated Controllers

Modeling of synchronous machine: Physical Characteristics. Rotor position dependent model. D-Q Transformation. Model with Standard Parameters. Steady State Analysis of Synchronous Machine. Short Circuit Transient Analysis of a Synchronous Machine. Synchronization of Synchronous Machine to an Infinite Bus. Modeling of Excitation and Prime Mover Systems. Physical Characteristics and Models. Excitation System Control. Automatic Voltage Regulator. Prime Mover Control Systems. Speed Governors..

Unit- IV Modeling of other Power System Components

Modeling of Transmission Lines and Loads. Transmission Line Physical Characteristics. Transmission Line Modeling. Load Models - induction machine model. Frequency and Voltage Dependence of Loads. Other Subsystems – HVDC and FACTS controllers, Wind Energy Systems.

Unit- V Stability Analysis

Angular stability analysis in Single Machine Infinite Bus System. Angular Stability in multimachine systems – Intra-plant, Local and Inter-area modes. Frequency Stability: Centre of Inertia Motion. Load Sharing: Governordroop. Single Machine Load Bus System: Voltage Stability. Introduction to Torsional Oscillations and the SSR phenomenon. Stability Analysis Tools:Transient Stability Programs, Small Signal Analysis Programs.

Enhancing System Stability

Planning Measures. Stabilizing Controllers (Power System Stabilizers). Operational Measures-Preventive Control. Emergency Control..

Course Learning Outcomes(CLOs) :

1. Understand the problem of power system stability and its impact on the sys
2. Analyse linear dynamical systems and use of numerical integration methods.
3. Model different power system components for the study of stability.
4. Understand the methods to improve stability.

Text/Reference Books

- 1. K.R. Padiyar, " Power System Dynamics, Stability and Control", B. S. Publications,
- 2002.
- 2. P. Kundur, " Power System Stability and Control", McGraw Hill, 1995.
- 3. P. Sauer and M. A. Pai, " Power System Dynamics and Stability" , Prentice Hall, 1997.

Online links for study & reference materials:

https://nptel.ac.in/courses/117/106/117106086/

Assessment method:(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PEC-MEL432 **Course Name:** Automobile Engineering
Course Credit: 3 **Total Contact Hour:** 30hr

Course Objective:

1. To familiarize with the terminology associated with Automotive Technology.
2. To understand the construction of Automobile.
3. To understand the working principles of various parts of Automobile.

Course Description:

This course is an introduction to learning of Automobile Engineering. Concepts will be applied in this course from previous courses you have taken like IC Engine, Transmission System, Machine Design, etc.

Course Contents:

Types of automobiles, vehicle construction and layouts, chassis, frame and body, vehicleaerodynamics, IC engines- components, function and materials, variable valve timing (VVT). Engine auxiliary s ystems, electronic injection for SI and CI engines, unit injector system, rotary distributor type and common rail direct injection system, transistor based coil ignition & capacitive discharge ignition systems, turbo chargers (WGT, VGT), engine emission control by 3-way catalytic converter system, Emission norms (Euro & BS). Transmission systems, clutch types & construction, gear boxes- manual and automatic gear shift mechanisms, Over drive, transfer box, flywheel, torque converter, propeller shaft, slip joints, universal joints, differential and rear axle, Hotchkiss drive and Torque tube drive. Steering geometry and types of steering gear box, power steering, types of front axle, types of suspension systems, pneumatic and hydraulic braking systems, antilock braking system (ABS), electronic brake force distribution (EBD) and traction control. Alternative energy sources, natural gas, LPG, biodiesel, bio-ethanol, gasohol and hydrogen fuels in automobiles, modifications needed, performance, combustion & emission characteristics of alternative fuels in SI and CI engines, Electric and Hybrid vehicles,
application of Fuel Cells.

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- Have good idea of function of each automobile component
- Have a clear idea about the overall vehicle performance

Text books:

1. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.
2. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.

Reference books:

1. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.
2. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course code :PCC-ME 303 **Course Name:** Industrial Manufacturing Processes

Course Credits :3 **Total Contact Hour:** 40 hr

Course Objectives:

- To understand and develop an appreciation of the processes in correlation with material properties
- To learn to change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods
- To understand the concept and basic mechanics of metal cutting, milling, drilling and grinding and allied

Course description:

This course is an introduction to learning and understanding different manufacturing principles which are required to solve the problems of industrial base. This course gives the insight view how shape and size correlated with grain structure and mechanical property. It explains how the properties can be altered through conventional and non conventional manufacturing processes.

Course Contents:

Unit-1

Casting: Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses.

Unit-2

Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming(forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy.

Unit-3

Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, Cutting tool materials, Cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining.

Unit-4

Additive manufacturing: Rapid prototyping and rapid tooling Joining/fastening processes: Physics of welding, brazing and soldering;design considerations in welding,Solid and liquid state joining processes;Adhesive bonding.

Unit-5

Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters, Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant &maskant, process

parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining

Course Learning Outcomes (CLOs):

Upon completion of this course the student will be able to:

- Select appropriate processes for manufacturing industrial products
- Identify routings of the operations and equipment involved in changing raw materials into useable products
- Propose the integration of appropriate processes in a proper sequence to manufacture an economical product

Text Books:

- Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014
- Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems

Reference books:

- Degarmo, Black &Kohser, Materials and Processes in Manufacturing

Online links for study and reference materials:

https://nptel.ac.in/courses/112/107/112107144/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PROJ-EE01 **Course Name: Project Work –I**

Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

The object of Project Work I is to enable the student to take up investigative study in the broad field of Electrical Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental committee.

SEMESTER VIII

Course Code: PECEE-11 **Course Name:Industrial Electrical Systems**
Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

1. Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
2. Understand various components of industrial electrical systems.
3. Analyze and selectthe proper size of various electrical system components.

Course Description:

This **course** contains basics of **electricity**, major **electrical systems** – its design and properties, trouble shooting devises and their operations along with safety engineering.

Course Contents:

Unit- I Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

Unit-IIResidential and Commercial Electrical Systems

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Unit-IIIIllumination Systems

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting

.**Unit- IV Industrial Electrical Systems I**

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Unit- V Industrial Electrical Systems II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Module 6: Industrial Electrical System Automation

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation

.Course Learning Outcomes(CLOs) :

- Basics about electrical equipment's in manufacturing
- Application of electrical equipment's in different types of industries
- Types and working of electric traction systems
- Industry oriented consumption of electrical energy
- Basics about Illumination and its types

Text/Reference Books

2. S. L. Uppal and G. C. Garg, " Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
3. K. B. Raina, " Electrical Design, Estimating & Costing", New age International, 2007.
4. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
5. Web site for IS Standards.
6. H. Joshi, " Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

Online links for study & reference materials:

https://nptel.ac.in/courses/117/106/117106086/

Assessment method:(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

CourseCode :ECEL21 **CourseName:EmbeddedSystems**

CourseCredit:3 **TotalContact Hour:40hr**

CourseObjective:

- ToprovideanoverviewofDesignPrinciplesofEmbeddedSystem.
- Toprovideclearunderstandingabouttheroleoffirmware,operatingsystemsincorrelationwith hardwaresystems.

CourseDescription :

Inthiscourseyouwilllearnthebasicsofdesigning,interfacing,configuring,andprogramming embedded systems. By the end of the course you will have mastered thebasics of embedded system design and programming. This course will help to prepare youforcuttingedgecareers in industryandresearch.

CourseContents:

Unit1

IntroductiontoEmbeddedSystemsDefinitionofEmbeddedSystem,EmbeddedSystemsVsGeneralComputing Systems,History ofEmbeddedSystems,Classification,MajorApplication Areas,Purpose of Embedded Systems,Characteristics andQuality AttributesofEmbedded Systems.

Unit2

Typical Embedded System: Core of the Embedded System: General Purpose and DomainSpecificProcessors,ASICs,PLDs,CommercialOff-The-ShelfComponents(COTS),Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing,MemoryselectionforEmbeddedSystems,SensorsandActuators,CommunicationInterface :Onboard and ExternalCommunication Interfaces.

Unit3

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, RealTime Clock, Watchdog Timer, Embedded Firmware Design Approaches and DevelopmentLanguages.

Unit4

RTOSBasedEmbeddedSystemDesign:OperatingSystemBasics,TypesofOperatingSystems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.Unit 5

TaskCommunication:SharedMemory,MessagePassing,RemoteProcedureCallandSockets,TaskSynchronization:TaskCommunication/SynchronizationIssues,TaskSynchronizationTechniques, Device Drivers, Howto Choosean RTOS.

CourseLearningOutcomes(CLOs):

- CLO1:ExpectedtounderstandtheselectionprocedureofProcessorsintheEmbeddeddomain.
- CLO2:DesignProcedureforEmbedded Firmware.
- CLO3:ExpectedtovisualizetheroleofRealtimeOperatingSystemsinEmbeddedSystems
- CLO4.ExpectedtoevaluatetheCorrelationbetweentasksynchronizationandlatencyissues

Textbooks :

- IntroductiontoEmbeddedSystems -ShibuK.V, McGraw Hill.

Reference books:

- EmbeddedSystems -RajKamal,TMH.
- EmbeddedSystemDesign-FrankVahid,TonyGivargis,JohnWiley.
- EmbeddedSystems –Lyla,Pearson,2013
- AnEmbeddedSoftwarePrimer-DavidE.Simon,PearsonEducation.

Online links for study & reference materials :https://nptel.ac.in/courses/108/102/108102045/https://nptel.ac.in/courses/106/105/106105193/

Assessmentmethod:(ContinuousInternalAssessment=40%,FinalExamination=60%)

Assessment-1	-05%
Assessment-2	-05%
Assessment-3(Midexam)	-20%
Assessment-3	-05%
Assessment-4	-05%
TotalInternalAssessment	**-40%**

Course Code: PEC-MEL 423 **Course Name:** Power Plant Engineering
Course Credit: 3 **Total Contact Hour:** 30hr

Course Objective:
To provide an overview of power plants and the associated energy conversion issues.

Course Description:
The course describes the fundamentals of various power plants. The course describes the various thermodynamic cycles used in thermal, gas, nuclear and hydroelectric power plants along with their classification. The course addresses about the various integral parts of different power plants (conventional and non-conventional). The course also addresses the various economic and environmental aspects related to power plants.

Course Contents:

UNIT 1:
Thermal power plants: Coal based thermal power plants, basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems

UNIT 2:
Gas turbine and combined cycle power plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

UNIT 3:
Nuclear power plants: Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

UNIT 4:
Hydroelectric power plants: Classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems

UNIT 5:
Energy, economic and environmental issues: Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

Course Learning Outcomes(CLOs) :
Upon completion of the course, the students can understand the principles of operation for different power plants and their economics.

Text books:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

Reference books:

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

Online links for study & reference materials:

https://nptel.ac.in/courses/112/107/112107291/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1 - 05%
Assessment-2 - 05%
Assessment-3(Midexam) - 20%
Assessment-3 - 05%
Assessment-4 - 05%
Total Internal Assessment - 40%

Course Code: PROJ-EE02 **Course Name: Project Work II & Dissertation**

Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EEP1;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee.