Department of Electrical Engineering
Syllabus Structure for

Final Year B. Tech (Electrical Engineering) 2016-17

Approved By BOS
Electrical Engineering

On 7th April, 2016

Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute)

Revised syllabus Implemented from 2016-17
<table>
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<tr>
<th>Sr.No</th>
<th>Course Code</th>
<th>Subject Title</th>
<th>Contact Hours</th>
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<th>Evaluation Scheme</th>
<th>Theory Marks</th>
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<tr>
<td>01</td>
<td>EE4011</td>
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<td>Operation and Maintenance of Wind and Solar Energy Systems (Audit)</td>
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Total Credits: 20, Total Contact Hours: 22 Hrs.

Note: Tutorial and Practical Shall be conducted in batches with batch strength not exceeding 25 students.
ISE: In Semester Evaluation
ESE: End Semester Examination
P-Pass, NP-Not Pass

<table>
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<tr>
<th>EE*</th>
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<tbody>
<tr>
<td>EE4051</td>
<td>Computer Modelling of Electrical Power System</td>
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<td>EE4071</td>
<td>FACTS and HVDC</td>
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<td>PIC Microcontroller</td>
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Revised syllabus Implemented from 2016-17
## Final Year U.G. Program in Electrical Engineering Semester VIII

<table>
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<tr>
<th>Sr. No</th>
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**Total** 12 10 21

Note: Tutorial and Practical Shall be conducted in batches with batch strength not exceeding 18 students.

**ISE**: In Semester Evaluation  **ESE**: End Semester Examination

### Open (Institute) Elective-II

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<thead>
<tr>
<th>EE**</th>
<th>Program Elective-II</th>
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<tbody>
<tr>
<td>EE4061</td>
<td>Energy Audit and Management</td>
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<td>EE4081</td>
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<tr>
<td>EE4101</td>
<td>Advanced Power Electronics</td>
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Final Year B.Tech (Electrical Engineering) – Part-I (Sem-VII)
Course – EE4011: High Voltage Engineering

Teaching Scheme: Lectures: 3hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Understand the basic generation and measurement of High voltage and High current for testing purposes
2. Comprehend Breakdown phenomenon in air, solid and liquid insulation
3. Test high voltage electrical Equipment with various testing devices.
4. Compare importance of different types of testing of high voltage plant.
5. Discuss the overvoltage phenomena and insulation coordination in power system.

Unit I:
Electrostatic fields and field stress control:

Unit II:
Electrical breakdown in gases:
Gases as insulating media - ionization and decay processes, Townsend first ionization coefficient, photoionization, ionization by interaction of metastable with atoms, thermal ionization, deionization by recombination, deionization by attachment–negative ion formation, examples - cathode processes – secondary effects, photoelectric emission, electron emission by positive ion and excited atom impact, thermionic emission, field emission, Townsend second ionization coefficient, secondary electron emission by photon impact, examples - transition from non-self-sustained discharges to breakdown, the Townsend mechanism, examples - the streamer or ‘kanal’ mechanism of spark, examples - the sparking voltage–Paschen’s law, penning effect, the breakdown field strength, breakdown in non-uniform fields.

Unit III:
Breakdown in liquid and solid dielectrics:
Liquid as insulators, breakdown in liquids - electronic breakdown, suspended solid particle mechanism, cavity breakdown, examples - static electrification in power transformers, transformer oil filtration, transformer oil test, alternative liquid insulations like vegetable oils, esters and silicon oils - breakdown in solids, intrinsic breakdown, streamer breakdown, electromechanical breakdown, edge breakdown and treeing, thermal breakdown, erosion breakdown, tracking breakdown of solid dielectrics in practice, partial discharges in solid insulation, solid dielectrics used in practice.
Unit IV:
Generation of high voltages:
Generation of high direct voltages, half and full wave rectifier circuits, voltage multiplier circuits, Van de Graff generators, electrostatic generators, examples - generation of alternating voltages, testing transformers, cascaded transformers, resonant transformers, examples - impulse voltages, Standard lightning and switching surge and associated parameters and their corrections, impulse voltage generator circuits, Marx circuit, operation, design and construction of impulse generators, examples - impulse current generator - control systems

Unit V:
Measurement of high voltages:
High direct voltage measurement, peak voltage measurements by spark gaps, sphere gaps, reference measuring systems, uniform field gaps, rod gaps, factors affecting sphere gap measurements, examples - electrostatic voltmeters - ammeter in series with high ohmic resistors and high ohmic resistor voltage dividers - generating voltmeters and field sensors - the measurement of peak voltages, the Chubb–Fortescue method, high-voltage capacitors for measuring circuits - voltage dividing systems and impulse voltage measurements, digital recorders, errors inherent in digital recorders

Unit VI:
Over voltages, testing procedures and insulation coordination:
The lightning mechanism, energy in lightning, nature of danger - laboratory high-voltage testing procedures and statistical treatment of results, examples - insulation coordination, insulation level, statistical approach to insulation coordination, correlation between insulation and protection levels - modern power systems protection devices, M O A – metal oxide arresters. High voltage testing: Testing of insulators and bushings, testing of isolators and circuit breakers Testing of cables, testing of transformers - testing of surge diverters - radio interference measurements - design, planning and layout of high voltage laboratory.

Reference Books:
Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Calculate mmf and thermal rating of various types of electrical machines.
2. Design armature and field systems for D.C. machines.
3. Design core, yoke, windings and cooling systems of transformers.
4. Design stator and rotor of induction machines.
5. Design stator and rotor of synchronous machines and study their thermal behavior.

Unit I:
Introduction: 03

Unit II:
DC Machines: 06

Unit III:
Transformers: 06

Unit IV:
Induction Motors: 06

Unit V:
Synchronus Machines: 06

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Unit VI:
Design of Electrical Machines Software: 03
Introduction to various design software used.

Text Books:

References:
Final Year B.Tech (Electrical Engineering) – Part-I (Sem-VII)
Course – EE4051: Computer Modeling of Electrical Power System

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Develop mathematical models of various equipment used in power system.
2. Apply various methods of load flow studies.
3. Develop the capabilities to analyze modelling of power plants.
4. Apply different numerical techniques to study load flow.
5. Explain the advantages of various iterative methods in power flow studies.

Unit I: 06

Unit II: 06
Three phase system analysis. Three phase models of transmission lines and transformers. Formation of the system admittance matrix.

Unit III: 06

Unit IV: 06

Unit V: 06

Unit VI: 06
Reference Books:

Teaching Scheme: Lectures: 3hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Understand the importance of controllable parameters and benefits of FACTS controllers.
2. Analyze the functional operation and control of series and shunt compensator.
3. Describe the principles, operation and control of Multi-functional FACTS controller.
4. Identify significance of DC over AC transmission system, types and application of HVDC links in practical power systems.
5. Apply various methods of grid control for HVDC systems.

Unit I:
Shunt Compensation:
Introduction, methods of Var generation: Thyristor controlled reactor (TCR), Thyristor switched capacitor (TSC), Fixed capacitor Thyristor controlled reactor (FC-TCR), STATCOM.

Unit II:
Series Compensation:
Introduction, comparison between series and shunt compensation. Various Equipment: GTO Controlled Series Capacitor (GCSC), Comparison of TCR and GCSC, Thyristor Switched Series Capacitor (TSSC), Thyristor Controlled Series Capacitor (TCSC), Static Synchronous Series Compensator (SSSC), modes of operation, voltage regulator and Phase Angle Regulator (PAR).

Unit III:
Multi-functional FACTS controller:
Unified Power Flow Controller (UPFC), IPFC, control capabilities of UPFC, 2-port representation of UPFC.

Unit IV:
Introduction to HVDC:
Introduction, various possible HVDC configurations, unipolar and bipolar links, components of HVDC system, Comparison of HVAC and HVDC systems, HVDC projects in India and abroad, Layout of HVDC station.

Unit V:
HVDC Controls:
Grid control of thyristor, valve-Analysis with grid control with no overlap, overlap less than 60 degrees and overlap greater than 60 degrees. Basic means of control, Power reversal, manual
control and its limitations-constant current versus constant voltage, desired features of control, actual control characteristics-constant minimum ignition angle, current and extinction angle controls, stability of control

Unit VI:
Protection Techniques for HVDC:
Disoperation of converters-short circuit on a rectifier – commutation failure, causes and remedies, Protection of HVDC system, D.C. rectors, damper circuits, Overcurrent protection and over-voltage protection, clearing fault and reenergizing the line.

Reference Books:
Final Year B.Tech (Electrical Engineering) – Part-I (Sem-VII)
Course – EE4091: PIC Microcontroller

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Compare different RISC and CISC microcontroller
2. Demonstrate an understanding of PIC microcontroller architecture.
3. Write assembly and C language programs.
4. Interface PIC microcontroller with 7-segment, LCD, keypad etc..
5. Design microcontroller based application.

Unit I:
Introduction to PIC Microcontrollers: 06
Introduction to PIC16F84/16F877, CISC, RISC, PIN Description, Clock/Instruction cycle, Applications and get familiar with PIC programmer

Unit II:
Inside PIC16F84/16F877 Architecture: 06
Detailed PIN Description, Ports, TRISA, TRISB, Memory Banks, Register, STATUS Register, SFR, INTCON, Setting I/O ports.

Unit III:
Timer and PWM Modules: 06
Detailed PIN Description, Timer 0, Timer 1, Timer 2, Capture/Compare/PWM Modules

Unit IV:
Instruction set in PIC16Cxx microcontroller family: 06
Basic elements of assembly language, an overview to complete set of instructions, data transfer, arithmetic and logic operator, bit operations, word list, writing a basic programming in assembly

Unit V:
Interfacing PIC: 06
Interfacing a Seven segment, Interfacing an LCD, Interfacing an NxM keypad with PIC, PWM

Unit VI:
Advanced Interfacing with PIC: 06
RS232 serial communication, Interfacing Relay and Motors, Sensors, ADC, Interrupts and Real Time Applications

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Resource:
1. PIC16F87X Data Sheet
2. www.microchip.com

Reference Books:
2. Programming and Customizing the PIC Microcontroller by Myke Predko, Mcgraw Hill Education.
Course – OE1: Linear and Nonlinear Optimization

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Explain the need and basic terms of the optimization
2. Classify optimization problem
3. Apply mathematical tools to solve optimization problem
4. Compare the different solution techniques

Unit I:
Introduction and Basic Concepts of optimization: 06
Historical Development; Engineering applications of Optimization; General model of Optimization problem: Objective function; Constraints and Constraint surface; Classification of optimization problems; Optimization techniques – classical and advanced techniques.

Unit II:
Optimization using Calculus: 06
Stationary points; Functions of single and two variables; Optimization of function of one variable and multiple variables; Examples; Optimization of function of multiple variables subject to equality constraints; Lagrangian function; Optimization of function of multiple variables subject to equality constraints; Hessian matrix formulation; Eigen values; Kuhn-Tucker Conditions; Examples.

Unit III:
Linear Programming: 06
Standard form of linear programming (LP) problem; Canonical form of LP problem; Assumptions in LP Models; Elementary operations; Examples; Motivation of simplex method, Simplex algorithm and construction of simplex tableau; Simplex criterion; Revised simplex method

Unit IV:
Non-Linear Programming: 06
Standard form of non-linear programming (NLP) problem; Direct root method: Newton, quasi-Newton, Secant methods; Examples
Unit V:
Introduction to Heuristic Techniques: 06
Introduction; Benchmark Test Function; Particle Swarm optimization algorithm; Example; Comparison of Heuristic Techniques and Numerical Technique

Unit VI:
Metaheuristic Technique: Artificial bee colony algorithm: 06
Introduction; Artificial bee colony algorithm, Example; Statistical analysis of Artificial Bee Colony Algorithm and Particle Swarm optimization Algorithm

Reference books:
3. Particle Swarm Optimization, Maurice Clerc, ISTE Ltd.
Course – EE4511: High Voltage Engineering Lab

Teaching Scheme: Practical: 2 hours/week
Exam Scheme: 100 Marks (ISE 50 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Apply knowledge of condition monitoring of transformer.
2. Test the dielectric properties of solid materials.
3. Test the dielectric properties of liquid and solid insulating materials.
4. Explain the behavior of circuit breakers and transformer.
5. Explain the behavior of impulse generator and lightning arrester.

List of Experiments:
1. Testing of transformer oil according to IS:6792
2. Testing of solid insulation with tape electrodes
3. Generation High D.C. Voltages and measurement through sphere gaps
4. Generation High A. C. voltages and measurement through sphere gaps
5. Generation of High A. C. voltages through cascaded transformers
6. Impulse voltage generation through Marx generator
7. Impulse voltage generation through simulation
8. Trace the field through electrolytic tank
9. Generation and visualization of corona in corona cage
10. Capacitance and loss factor measurement
11. A report on visit to high voltage laboratory
Final Year B.Tech (Electrical Engineering) – Part-I (Sem-VII)
Course – EE4531: Electrical Machine Design Lab

Teaching Scheme: Practical: 2 hours/week
Exam Scheme: 100 Marks (ISE 50 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Calculate various parameters required for design
2. Design specific electrical machine as per requirement
3. Apply and design the electrical machine in software.

List of Experiments:
1. Introduction to design in Virtual environment
2. Design of DC Machine
3. Design of Transformer
4. Design of Synchronous Machine
5. Design of 3-phase Induction Motor
6. Design of 1-phase Induction Motor
7. Introduction to Maxwell software
8. Design of electrical machines in Maxwell
Final Year B.Tech (Electrical Engineering) – Part-I (Sem-VII)
Course – EE4551: Project Phase - I

Teaching Scheme: Project: 4 hours/week
Exam Scheme: 100 Marks (ISE 50 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Identify and analyze problems in the field of electrical engineering.
2. Formulate and solve practical problems in Electrical Engineering in systematic way by applying suitable skills, tools and methodologies.
3. Demonstrate the importance of working in teams with complementary skills.
4. Disseminate knowledge by writing good technical report.
5. Work in interdisciplinary project assignments.

General Guidelines:
Project group will consist of 4-5 students. The group of students will identify project work based on academic developments in the field of electrical engineering or the group members can contact industrial/commercial organizations for sponsored project work.

In case of industrially sponsored project the students will collect information about technical problem to be addressed. The information can be in the form of technical data or electrical system to be realized in hardware.

In the case project work based on academic development, the students are expected to make use of web resources to identify project work to be carried out in Phase-II.

In both cases the students are expected to analyze the data or to simulate the electrical system using suitable computational tool as a part of phase-I project work.

The assessment of B. Tech project work Phase- I shall be carried out as shown below:

Project Evaluation:
The ISE evaluation of B. Tech project phase-I will be carried out in three phases that includes Synopsis presentation (10%), first review presentation (10%) and Final presentation of phase-I project work (30%). The ESE evaluation (50%) will be done as per schedule given by COE where students have to present their analytical/ modeling/ simulated work. The evaluation will be done by panel of examiners consisting of project guide and a faculty members appointed by DPC.

* As per U.G. Academic Rules and Regulations.
Final Year B.Tech (Electrical Engineering) – Part-I (Sem-VII)
Course – EE4511: Operation and Maintenance of Wind and Solar Energy System (Audit)
Teaching Scheme: Practical: 2 hours/week
Exam Scheme: 100 Marks (ISE 100)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Prepare report on wind resource assessment
2. Operate and maintain squirrel cage and DFIG based systems.
3. Compute reactive power requirement for standalone wind turbine system
4. Demonstrate the effects of shadowing on PV modules
5. List the installation materials for off grid PV systems

List of Experiments:
1. Wind resource assessment for wind farm layout.
2. Emulation of induction generator.
4. Stand-alone wind energy generator emulation using squirrel cage induction generator feeding power to the mains.
5. Reactive power requirements and power factor correction
6. Time domain model with PSCAD/EMTDC and MATLAB/Simulink
7. I-V and P-V characteristics of PV module with varying radiation and temperature level.
8. Effect of variation in tilt angle on PV module power.
9. Effect of shading on module output power.
10. Working of diode as bypass diode and blocking diode.
11. Power flow calculations of standalone PV system of DC load with battery
12. Power flow calculations of standalone PV system of DC and AC load with battery.

Resources:
1. Wilhelm Kirchensteiner –Solar Power Laboratory
6. Freris, Leon and Infield, David. Renewable in power systems
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4021: Industrial Organization and Management

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Explain the need and basic terms of the optimization
2. Classify optimization problem
3. Apply mathematical tools to solve optimization problem
4. Compare the different solution techniques

Unit I:
Industrial Management: 06

Unit II:
Human Resource Management: 06

Unit III:
Materials Management: 06
Definition, Scope, advantages of materials management, functions of materials management, Purchase Objectives, 5-R Principles of purchasing, Functions of Purchase department, Purchasing cycle, Purchase policy & procedure, Evaluation of Purchase Performance.

Unit IV:
Marketing: 06

Unit V:
Financial Management: 06
Unit VI:
Industrial Psychology and Personal Management:

06
Definition, scope of Industrial psychology - Individual and group-motive and morale. Fatigue, causes and remedy - accidents causes and prevention - manpower planning, job analysis and merit rating - wage and salary administration - causes of Industrial unrest - collective bargaining


References
1. Industrial engineering & management – O.P. Khanna.
5. Industrial Organization and Management- M.T.Telsang, S. Chand & Co.
6. Essentials of management – Koontz & O’ Donell
7. Marketing management – Philip Kotler, Prentice Hall of India New Delhi
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4041: Automation and Control

Teaching Scheme: Lectures: 3hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Explain the need of industrial automation.
2. Develop RLL diagrams for the given logic gates.
3. List standard IEC programming languages.
4. Develop relay logic ladder diagram for the given application.
5. Develop GUI for monitoring system of the given real time applications using SCADA.

Unit I:
Automation Overview: 06
Brief description of a control system, need of Industrial automation, architecture of Industrial automation, application of industrial automation, Introduction to Programmable Controllers. Case study: relay logic based control system design.

Unit II:
Number systems and codes, Logic concepts: 06
Number systems, number conversions one’s and two’s compliments, binary codes, register word formats, binary concept, logic functions, principles of Boolean algebra and Logic, PLC circuits and Logic contact symbology. Case study: Developing RLL diagrams of Logic gates.

Unit III:
Components and Systems: 06

Unit IV:
PLC Programming: 06
Programming Languages, the IEC 1131 Standard and Programming Language, System Programming and Implementation, PLC System Documentation.

Unit V:
Ladder logic programming and Applications: 06
Mathematical, logical, special function and branch instructions, Timer, Counter, Process Controllers and Loop Tuning. Case studies.

Unit VI:
SCADA and HMI: 06

Revised syllabus Implemented from 2016-17
SCADA System Introduction, creating new project, GUI design, Tag substitutions, Alarms & event, application of scripts, communication with PLC, Programming for GUI using SCADA. Case study on SCADA based PLC system monitoring.

References:
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4061: Energy Audit and Management

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Classify energy intensive systems.
2. Decide the energy conservation and energy efficiency opportunities in the systems.
3. Prepare action plan to monitor energy consumption pattern of systems and processes.
4. Compute the energy saving potential in electrical and thermal utilities.
5. Prepare detailed energy audit report of system or processes.

Unit I:
Basics of Energy Management and Conservation:
Global and Indian energy scenario. Global environmental concerns, Climate Change, Concept of energy management, energy demand and supply, economic analysis; Carbon Trading & Carbon foot prints. Energy Conservation: Basic concepts, Energy conservation in household, transportation, agricultural, service and industrial sectors; Lighting & HVAC systems in buildings.

Unit II:
Energy Audit:
Definition, need, and types of energy audit; Energy management (audit) approach: Understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements; Fuel & energy substitution; Energy audit instruments; Energy Conservation Act; Duties and responsibilities of energy managers and auditors.

Unit III:
Material & Energy balance and Waste Heat Recovery:
Facility as an energy system; Methods for preparing process flow; material and energy balance diagrams. Cogeneration and waste heat recovery.

Unit IV:
Energy Action Planning, Monitoring and Targeting:
Energy Action Planning : Key elements; Force field analysis; Energy policy purpose, perspective, contents, formulation, ratification; Organizing the management: location of energy management, top management support, managerial function, roles and responsibilities of energy manager, accountability; Motivation of employees: Information system-designing barriers, strategies; Marketing and communicating: Training and planning. Monitoring and Targeting: Defining monitoring & targeting; Elements of monitoring & targeting; Data and information
analysis; Techniques: energy consumption, production, cumulative sum of differences (CUSUM); Energy Service Companies; Energy management information systems; SCADA systems.

Unit V:
Electrical Energy Management: 06
Supply side: Methods to minimize supply-demand gap, renovation and modernization of power plants, reactive power management, Demand side management: conservation in motors, pumps and fan systems; energy efficient motors.

Unit VI:
Thermal energy Management: 06
Energy conservation in boilers, steam turbines and Furnaces; Application of FBC, Heat exchangers and heat pumps.

Text Books:
1. Handbook on Energy Audits and Management, Amit Kumar Tyagi, TERI Publication

References:
5. Handbook of Energy Audit and Environment Management Y.P. Abbi, Shashank Jain TERI
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4081: Power System Planning

Teaching Scheme: Lectures: 3hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Explain the need of power system expansion.
2. Analyze the given power system for determining optimal values of decision variables.
3. Apply mathematical tools to solve multi-objective optimization problems in expansion planning and reliability studies.
4. Explain long term and short term planning.
5. Discuss various economic analysis methods.

Unit I:
Power System Planning, Basic Principles: 06

Unit II:
Some Economic Principles: 06

Unit III:
Load Forecasting: 06
Introduction, Load Characteristics, Load Driving Parameters, Spatial Load Forecasting, Long Term Load Forecasting Methods, Trend Analysis, Econometric Modelling, End-use Analysis, Combined Analysis.

Unit IV:
Generation Expansion Planning: 06
Multi-bus Generation Expansion Planning: Introduction, Problem Description, A Linear Programming (LP) Based GEP, Basic Principles, Mathematical Formulation, Numerical Results A Genetic Algorithm (GA) Based GEP, Numerical Results for GA-based Algorithm

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Revised syllabus Implemented from 2016-17
Unit V:
Substation Expansion Planning:

Unit VI:
Network Expansion Planning, a Basic Approach:
Introduction, Problem Definition, Problem Description, Problem Formulation, Objective Function, Constraints, Solution Methodologies, Enumeration Method, Heuristic Methods, Numerical Results, Garver Test System, A Large Test System.

References:
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4101: Advanced Power Electronics

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Apply knowledge of modern power electronic converters and its applications in electric power utility.
2. Compute mathematical model of converters.
3. Solve the state space model for power converters.
4. Analyze resonant converters and their topologies.
5. Analyze the operation of power conditioners, filters, UPS systems.

Unit I:
DC -DC Converters:
Principles of stepdown and stepup converters. Analysis and state space modelling of Buck, Boost, Buck, Boost and Cuk converters.

Unit II:
Switching Mode Power Converters:
Analysis and state space modeling of flyback, Forward, Half bridge and full bridge Converters control circuits and PWM techniques.

Unit III:
Resonant Converters:
Introduction, classification, basic concepts, Resonant switch, Load Resonant Converters, ZVS, Clamped voltage topologies, DC link inverters with Zero Voltage Switching, Series and parallel, Resonant inverters Voltage control.

Unit IV:
DC -AC Converters:
Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques Multilevel inverters Concepts Types: Diode clamped, Flying capacitor, Cascaded types Applications.

Unit V:
Power Conditioners, UPS and Filters:
Introduction Power line disturbances Power conditioners UPS: offline UPS, Online UPS, Applications Filters: Voltage filters, Series parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters Design of inductor and transformer for PE applications, Selection of capacitors.

Revised syllabus Implemented from 2016-17
Unit VI:
Power Quality Mitigation Devices:
Passive filters, active filters, hybrid filters. DTSTCOM (Distribution static compensator), DVR (Dynamic voltage restorer) and UPQC(Universal power quality conditioner).

References:
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – OE: Wind Energy Engineering

Teaching Scheme: Lectures: 3 hours/week
Exam Scheme: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Apply fundamental principles of thermodynamics, fluid mechanics and mechanical systems to wind turbine engineering.
2. Calculate various parameters related to wind turbine.
4. Design in virtual environment.
5. Work on team-based projects.

Unit I:
The Wind Resource: 06
The Nature of the Wind; Geographical Variation in the Wind Resource; Long-term Wind-speed Variations; Annual and Seasonal Variations; Synoptic and Diurnal Variations; Turbulence; Gust Wind Speeds; Extreme Wind Speeds, Turbulence in Wakes and Wind Farms, Turbulence in Complex Terrain.

Unit II:
Aerodynamics of Horizontal-axis Wind Turbines: 06

Unit III:
Wind-turbine Performance: 06

Unit IV:
Conceptual Design of Horizontal Axis Wind Turbines: 06
Introduction, Rotor Diameter, Machine Rating, Rotational Speed, Number of Blades, Power Control, Braking Systems, Fixed-space, Two-speed or Variable-speed Operation, Type of Generator.

Unit V:
Component Design: 06
Blades, Pitch Bearings, Rotor Hub, Gearbox, Generator, Mechanical Brake, Yaw Drive, Tower, Foundations.

Revised syllabus Implemented from 2016-17
Unit VI:
Wind-turbine Installations and Wind Farms: 06

References:
2. Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi.
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4521: Automation and Control Lab

Teaching Scheme: Practical: 2 hours/week
Exam Scheme: 100 Marks (ISE 50 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Design relay logic based control system for the given applications
2. Develop RLL diagrams for the given applications.
3. Apply SCADA for GUI based monitoring system of the given real time applications.

List of Experiments:
1. Relay logic based ON/OFF control of the submersible pump.
2. Relay logic based ON/OFF control of the mechanical based pressing tool system.
3. Develop RLL for given logic gates
4. RLL based ON/OFF control of the submersible pump.
5. RLL based ON/OFF control of the mechanical based pressing tool system.
6. Applications using instructions like DI, DO, L & U, binary etc.
7. Applications using TIMER instructions
8. Applications using COUNTER instructions
9. Applications using MATH instructions
10. Applications using COMPARE instructions
11. Applications using LOGICAL instructions
12. Applications using SCP instruction.
Final Year B.Tech (Electrical Engineering) – Part-II (Sem-VIII)
Course – EE4541: Project Phase - II

Teaching Scheme: Project: 4 hours/week
Exam Scheme: 100 Marks (ISE 50 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. Identify and analyze problems in the field of electrical engineering.
2. Formulate and solve practical problems in Electrical Engineering in systematic way by applying suitable skills, tools and methodologies.
3. Demonstrate the importance of working in teams with complementary skills.
4. Disseminate knowledge by writing good technical report.
5. Work in interdisciplinary project assignments.

General Guidelines:
During phase-II project work the students are expected to synthesize the analyzed/simulated information either in the form of model or prototype hardware.

The Project report should be prepared strictly as per the given format by DPC. A soft copy of project report will be required to be submitted and will be checked by the supervisor for plagiarism by licensed software tool (Turnitin).

The final copy of report should have similarity index less than 20% with entire report free from grammatical and spelling mistakes.

Project Evaluation:
The evaluation of the project work will be based on attributes like quality of scientific work, contributions, participation in project exhibitions.

The assessment of B. Tech project work Phase- II shall be carried out as shown below:

The ISE evaluation of B. Tech project phase- II will be carried out in three phases that includes Progress Seminar-I (10%) will be assessed by respective guide. Participation in project exhibition will carry credit of 30%. Final presentation (10%) will be assessed by panel of committee members along with guide. The ESE (final orals and presentations) (50%) evaluation will be done as per schedule given by COE where students have to present their entire project work and final report. The evaluation will be done by panel of examiners consisting of project guide and a faculty appointed by DPC.

* As per U.G. Academic Rules and Regulations.