**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES (AUTONOMOUS)**
**RAJAMPET**

**Department of Electrical and Electronics Engineering**

**Course Structure for R19 Regulations**

**I Year I Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | BS | 19AC12T | Applied Physics | 3 | - | - | 3 |
| 2 | BS | 19AC11T | Algebra and Calculus | 3 | 1 | - | 4 |
| 3 | ES | 19A511T | Problem Solving and C Programming | 3 | - | - | 3 |
| 4 | ES | 19A411T | Essentials of Electrical & Electronics Engineering | 2 | - | - | 2 |
| 5 | ES | 19A312T | Engineering Graphics & Design | 1 | - | 3 | 2.5 |
| Lab Courses | | | | | | | |
| 6 | BS | 19AC12L | Applied Physics Lab | - | - | 3 | 1.5 |
| 7 | ES | 19A313L | Engineering & IT Workshop | - | - | 3 | 1.5 |
| 8 | ES | 19A511L | C Programming Lab | - | - | 3 | 1.5 |
| 9 | ES | 19A411L | Essentials of Electrical & Electronics Engineering Lab | - | - | 2 | 1 |
| | | | | 12 | 1 | 14 | 20 |

**I Year II Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | HS | 19AC25T | Functional English and Life Skills | 3 | - | - | 3 |
| 2 | ES | 19A522T | Programming Through Python | 3 | - | - | 3 |
| 3 | BS | 19AC24T | Engineering Chemistry | 3 | - | - | 3 |
| 4 | BS | 19AC21T | Differential Equations and Vector Calculus | 3 | 1 | - | 4 |
| 5 | ES | 19A421T | Electronic Devices and Circuits | 2 | - | - | 2 |
| 6 | MC | 19AC26T | Environmental Science | 3 | - | - | - |
| Lab Courses | | | | | | | |
| 7 | HS | 19AC25L | Communicative English Lab | - | - | 3 | 1.5 |
| 8 | ES | 19A522L | Programming Through Python Lab | - | - | 2 | 1 |
| 9 | BS | 19AC24L | Engineering Chemistry Lab | - | - | 3 | 1.5 |
| 10 | ES | 19A421L | Electronic Devices and Circuits Lab | - | - | 2 | 1 |
| | | | | 17 | 1 | 10 | 20 |

**II Year I Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | BS | 19AC31T | Partial Differential Equations and Complex Variables | 3 | - | - | 3 |
| 2 | PC | 19A231T | Analog Electronics | 3 | - | - | 3 |
| 3 | PC | 19A232T | Circuit Theory | 3 | - | - | 3 |
| 4 | PC | 19A233T | Electrical Machines-I | 3 | - | - | 3 |
| 5 | PC | 19A234T | Switching Theory and Logic Design | 3 | - | - | 3 |
| 6 | ES | 19A337T | Fluid Mechanics and Hydraulic Machinery | 2 | 1 | - | 3 |
| 7 | MC | 19AC35T | Essence of Indian Traditional Knowledge | 3 | - | - | - |
| Lab courses | | | | | | | |
| 8 | ES | 19A337L | Fluid Mechanics and Hydraulic Machinery Lab | - | - | 2 | 1 |
| 9 | PC | 19A231L | Analog Electronics lab | - | - | 2 | 1 |
| 10 | PC | 19A233L | Electrical Machines -I Lab | - | - | 2 | 1 |
| | | | | 20 | 1 | 6 | 21 |

**II Year II Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | BS | 19AC42T | Numerical Methods and Transform Techniques | 3 | - | - | 3 |
| 2 | PC | 19A241T | Electrical Machines -II | 3 | - | - | 3 |
| 3 | PC | 19A242T | Electromagnetic Fields | 3 | - | - | 3 |
| 4 | PC | 19A243T | Generation and Transmission of Electric Power | 3 | - | - | 3 |
| 5 | PC | 19A244T | Linear Control Systems | 3 | - | - | 3 |
| 6 | PC | 19A245T | Network Analysis and Synthesis | 3 | - | - | 3 |
| 7 | BS | 19AC44T | Life Sciences for Engineers | 2 | - | - | 2 |
| 8 | MC | 19AC47T | Constitution of India | 3 | - | - | - |
| Lab courses | | | | | | | |
| 8 | PC | 19A241L | Electrical Machines -II Lab | - | - | 3 | 1.5 |
| 9 | PC | 19A245L | Electrical Circuits and Simulation Lab | - | - | 3 | 1.5 |
| | | | | 23 | 0 | 6 | 23 |

**III Year I Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | HS | 19A354T | Management Science | 3 | - | - | 3 |
| 2 | PC | 19A251T | Electrical and Electronic Measurements | 3 | - | - | 3 |
| 3 | PC | 19A252T | Power Electronics | 3 | - | - | 3 |
| 4 | PC | 19A253T | Power System Analysis | 3 | - | - | 3 |
| 5 | PE | 19A25AT | Digital Control Systems | 3 | - | - | 3 |
| | | 19A25BT | Renewable Energy Systems | | | | |
| | | 19A25CT | Modern Control Theory | | | | |
| 6 | OE | 19A25DT | Fuzzy Logic and Neural Network | 3 | - | - | 3 |
| | | 19A25ET | Battery Energy Storage Systems | | | | |
| | | 19A25FT | System Modeling and Simulation | | | | |
| Lab Courses | | | | | | | |
| 7 | PC | 19A254L | Electrical Measurements Lab | - | - | 2 | 1 |
| 8 | PC | 19A255L | Control Systems & Simulation Lab | - | - | 2 | 1 |
| 9 | HS | 19AC52L | Professional Communication Skills Lab | - | - | 3 | 1.5 |
| | | | | 18 | 0 | 7 | 21.5 |

**III Year II Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | PC | 19A261T | Microprocessors and Microcontrollers | 3 | - | - | 3 |
| 2 | PC | 19A262T | Power System Operation and Control | 2 | - | - | 2 |
| 3 | PC | 19A263T | Switch Gear and Protection | 3 | - | - | 3 |
| 4 | PE | 19A26AT | High Voltage Engineering | 3 | - | - | 3 |
| | | 19A26BT | Electrical Machine Design | | | | |
| | | 19A26CT | Utilization of Electrical Energy | | | | |
| 5 | PE | 19A26DT | Instrumentation | 3 | - | - | 3 |
| | | 19A26ET | Fundamentals of HVDC & FACTS Devices | | | | |
| | | 19A26FT | Advanced Power Electronic Converters | | | | |
| 6 | OE | 19A26IT | Open Elective-2 (MOOCS) | 3 | - | - | 3 |
| 7 | HS | 19AC63T | Universal Human Values – II | 1 | 1 | - | 2 |
| Lab Courses | | | | | | | |
| 8 | PC | 19A264L | Power System Simulation Lab | - | - | 2 | 1 |
| 9 | PC | 19A265L | Power Electronics & Simulation Lab | - | - | 3 | 1.5 |
| 10 | HS | 19AC61L | General Aptitude | - | - | 2 | 1 |
| 11 | INTERN | 19A264I | Innovative project / Socially relevant project / Entrepreneurship / Internship | - | - | - | 2 |
| | | | | 17 | 0 | 7 | 24.5 |

**IV Year I Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | PC | 19A271T | Distribution of Electric Power | 3 | - | - | 3 |
| 2 | PC | 19A272T | Power Semiconductor Drives | 2 | - | - | 2 |
| 3 | PE | 19A27AT | Special Electrical Machines | 3 | - | - | 3 |
| | | 19A27BT | Smart Grid | | | | |
| | | 19A27CT | Principles of Power Quality | | | | |
| 4 | PE | 19A27DT | Programmable Logic Controllers | 3 | - | - | 3 |
| | | 19A27ET | Hybrid Electric Vehicles | | | | |
| | | 19A27FT | Digital Signal Processing | | | | |
| 5 | OE | 19A17GT | Basic Civil Engineering | 3 | - | - | 3 |
| | | 19A17HT | Water Resources and Conservation | | | | |
| | | 19A37JT | Introduction to Mechatronics | | | | |
| | | 19A37KT | Fundamentals of Robotics | | | | |
| | | 19A37LT | Non-Conventional Sources of Energy | | | | |
| | | 19A47GT | Electronic Circuits and its Applications | | | | |
| | | 19A47HT | Basics of Communication Systems | | | | |
| | | 19A57ET | Artificial Intelligence | | | | |
| | | 19A57FT | Cyber Security | | | | |
| Lab Courses | | | | | | | |
| 6 | PC | 19A273L | Power Systems Lab | - | - | 2 | 1 |
| 7 | PC | 19A274L | Microprocessors and Microcontrollers Lab | - | - | 2 | 1 |
| 8 | PW | 19A275P | Project Phase-I | - | - | - | 2 |
| | | | | 15 | 0 | 6 | 18 |

**IV Year II Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | PE | 19A28AT | Design of Electrical Systems | 3 | - | - | 3 |
| | | 19A28BT | Distributed Energy systems | | | | |
| | | 19A28CT | Energy Auditing and Demand Side Management | | | | |
| 2 | OE | 19A18DT | Disaster Management | 3 | - | - | 3 |
| | | 19A18ET | Building Planning and Construction | | | | |
| | | 19A38ET | Entrepreneurship Development | | | | |
| | | 19A38FT | Optimization in Engineering | | | | |
| | | 19A38GT | Total Quality Management | | | | |
| | | 19A48DT | Introduction to Digital Design | | | | |
| | | 19A48ET | Industrial Electronics | | | | |
| | | 19A58ET | Internet of Things | | | | |
| | | 19A58FT | Web Programming | | | | |
| Lab Courses | | | | | | | |
| 3 | PW | 19A281P | Project Phase-II | - | - | - | 8 |
| | | | | 6 | - | 12 | 14 |

## OPEN ELECTIVE COURSES (For Other Departments offered by EEE)

| S. No. | Category | Course Code | Course Title | Offered to |
|---|---|---|---|---|
| 1 | OE2 | 19A26GT | Energy Management and Conservation | CE, ME & CSE Students |
| 2 | OE2 | 19A26HT | Fuzzy Logic and Neural Network | |
| 3 | OE3 | 19A27GT | Energy Management and conservation | ECE Students ( For CE,ME & CSE- MOOCS ) |
| 4 | OE3 | 19A27HT | Fuzzy Logic and Neural networks | |
| 5 | OE4 | 19A28DT | Battery Energy Storage Systems | CE, ME, CSE & ECE Students |
| 6 | OE4 | 19A28ET | System Modeling and Simulation | |

**List of Value-added Courses**

1. Introduction to MATLAB Programming Techniques.
2. MATLAB SIMULINK for Electrical Systems
3. Electrical CAD
4. Internet of Things Applications to Electrical Engineering
5. Microcontrollers and Embedded Systems
6. PCB Design
7. PLC &SCADA
8. Solar Energy Course

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET**

**(An Autonomous Institution)**

Title of the course : Management Science
Category : HS
Course Code : 19A354T
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To understand the basic concepts of management and organization structures, types, merits and demerits.
- To give a clear idea about the plant layout and methods of production and understand the basic concepts of marketing and product life cycle.
- To understand the function of HR manager & industrial relations.
- To understand the concepts of Financial Management. Understand the concepts of PERT, CPM and how to draw the network diagram.
- To understand the concepts of MIS, TQM, JIT etc. Understand the importance of ethics in an organization.

Unit 1 Management and Organization Structure 10

Meaning, Nature, Importance Elements Of Management; Planning, Organizing, Staffing, Directing, Coordinating, Reporting, Budgeting- Systems Approach To Management Evolution Of Scientific Management, Modern Management. Principles Need Of Organization Structure- Types Of Organization Structure Line, Line And Staff, Functional And Matrix Organizations.

Unit 2 Operations Management & Marketing Management 10

Plant Location And Layout Methods Of Production (Job, Batch And Mass Production) Objectives Of Inventory Management- Need For Inventory Control- Method Of Inventory Management: EOQ, ABC Analysis - Core Concepts Of Marketing. Need, Want, Demand, Product, Value, Satisfaction, Marketing Mix- Product, Price, Place, Promotion, Product Levels – Product Life Cycle, – Channels Of Distribution.

Unit 3 Human Resources Management (HRM) 10

Significance Of HRM, Basic Functions Of HR manager, HR planning Job evaluation and Recruitment Selection and Placement, Induction and Training. Performance Appraisal. Compensation. Industrial Relations.

Unit 4 Financial Management, Project Management (PERT/CPM): 10

Objectives, Scope, Techniques Of Investment Analysis, Pay Back Period, Accounting Rate Of Return, And Working Capital Cost Of Capital. Sources Of Financing**.** Network Drawing - Program me Evaluation And Review Technique (PERT) – Critical Path Method (CPM) – Probability Of Completing the project within given time Project Crashing (Simple Problems).

Unit 5 Advances in Management Practices 10

Basic Concepts And Overview Of Management Information System (MIS), Enterprise Resource Planning (ERP), Value Analysis, Just –In-Time (JIT), Total Quality Management (TQM) And Supply Chain Management. Overview Of Ethics-Nature And Objectives Of Ethics - Relationship Between Ethics And An Organization.

Prescribed Text Books:

1. Industrial Management by O.P.Khanna, 17 Edition, ISBN: 9788189928353, 9788189928353
2. Management Science by Aryasri, McGraw Hill Education India, ISBN: 9780070090279, 9780070090279
3. Manufacturing Organization and Management, 6th Edition, Pearson Education India, ISBN: 9788177582758, 9788177582758

Reference Books:

1. Stoner, Freeman, Gilbert, Management, Pearson Edu., 2005, 6th Ed, ISBN: 9788131707043, 8131707040
2. Panneer Selvam, Production and Operations Management. PHI, 2004.ISBN, 8120324528, 9788120324527

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand the basic concepts of management and organization, structures, types, merits and demerits | L1 |
| 2. Give a clear idea about the plant layout and methods of production. Understand the basic concepts of marketing and product life cycle. | L1 |
| 3. Understand the function of HR manager & industrial relations. | L1 |
| 4. Understand the concepts of Financial Management. Understand the concepts of PERT, CPM and how to draw the network diagram. | L3 |
| 5. Understand the concepts of MIS, TQM, JIT etc. and the importance of ethics in an organization | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A354T.1 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | - | 2 | - |
| 19A354T.2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | - | 2 | - |
| 19A354T.3 | 3 | 3 | 3 | - | - | - | - | - | 3 | - | 3 | - | 2 | - |
| 19A354T.4 | 3 | 3 | 3 | 1 | 3 | - | - | - | 3 | - | 3 | - | 2 | 2 |
| 19A354T.5 | - | 3 | 3 | - | 3 | 1 | 1 | - | 3 | 1 | 3 | - | 2 | 2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCESRAJAMPET**

**(An Autonomous Institution)**

Title of the course : Electrical and Electronic Measurements
Category : PC
Course Code : 19A251T
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To learn basic principles of all measuring instruments.
- Also to learn the measurement of RLC parameters using various bridges.
- To be familiar with the measurement of voltage, current, power, energy and power factor by using different meters.
- To analyze the cathode ray oscilloscope and digital meters.

Unit 1 Measuring Instruments 12

Methods of measurements, Classification of instruments, Characteristics of instruments, Error-definition and types – Forces required to operate an instrument, different mechanisms used to obtain deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance.

Unit 2 Measurement Of Power, Energy & Power Factor Meters 12

Power measurement: Single-phase dynamometer wattmeter – LPF wattmeter – Double element and three element dynamometer wattmeter. Energy measurement: Single-phase induction type energy meter – Driving and braking torques – Errors and compensations – Three-phase energy meter. Power factor meters: Dynamometer and moving iron type – Single-phase and three-phase meters.

Unit 3 Potentiometers & Instrument Transformers 12

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: Polar and Coordinate type's standardization – applications.

CT and PT- Definitions and purpose - Ratio and Phase angle error (Only formula)- Design considerations.

Unit 4 D.C & A.C Bridges 12

Method of measuring low, medium and high resistance – sensitivity of Wheat stone's bridge – Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Measurement of inductance–Maxwell's bridge, Anderson's bridge. Measurement of capacitance–Desauty's bridge, Schering Bridge. Measurement of frequency–Wien's bridge.

Unit 5 OSCILLOSCOPE, SMART& DIGITAL METERS 12

Cathode Ray Oscilloscope- Cathode Ray tube-Time base generator- Horizontal and Vertical amplifiers application of CRO – Measurement of phase, frequency, current & voltage- Lissajous pattern.

Digital Voltmeter - Successive approximation, ramp and integrating type DVM's, Digital frequency meter-Digital multimeter-Digital Tachometer.

Construction and working of smart energy meter-Advantages and Disadvantages

Prescribed Text Books:

1. E.W. Golding and F.C. Widdis Electrical Measurements and measuring Instruments, 5th Edition, Reem Publications.
2. A.K.Sawhney, Electrical & Electronic Measurement & Instruments, Dhanpat Rai & Co. Publications.

Reference Books:

1. R. K.Rajput Electrical & Electronic Measurement & Instrumentation., 2nd Edition, S. Chand & Co.
2. H. S. Kalsi Electronic Instrumentation .Tata Graw Hill Mc, 3rd Edition.
3. Buckingham and Price Electrical Measurements, Prentice –Hall
4. Reissland, M.U Electrical Measurements: Fundamentals, Concepts, Applications-New Age International (P) Limited, Publishers.

Course outcomes: At the end of the course the student will be able to — Blooms Level

1. Describe basic requirements and the concepts of electrical measuring instruments. — L1
2. Measure the energy and power through energy meter and wattmeter. — L2
3. Explain the concept of potentiometers and instrument transformers. — L2
4. Measure the resistance, inductance, capacitance and frequency. — L1
5. Explain the principle and operation of CRO, Smart and digital meters. — L2

CO-PO-PSO Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A251T .1 | 1 | 1 | - | - | - | - | - | - | 3 | - | - | - | 1 | - |
| 19A251T .2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| 19A251T .3 | 2 | 2 | 2 | - | - | - | - | - | 3 | - | - | - | 2 | 2 |
| 19A251T .4 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
| 19A251T .5 | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - | 1 | 1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCESRAJAMPET**

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Title of the Course : Power Electronics
Category : PC
Course Code : 19A252T
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- Introduce the basic theory of power semiconductor devices & their practical application in power electronics.
- Familiarizes the operating principle of AC-DC, DC-DC, DC-AC, AC-AC conversion circuits and their applications.

Unit 1 Fundamentals of Silicon Controlled Rectifier 10

Brief introduction of Thyristor family –Basic operation of Power BJT, Power MOSFET and Power IGBT- Silicon Controlled Rectifiers (SCR's) – Principle of operation of SCR – Static characteristics and Dynamic turn ON switching characteristics of SCR - Turn ON methods of SCR- Turn OFF mechanism and turn OFF methods-Natural and Forced Commutation methods for SCR-Series and parallel connections of SCRs-R and RC Triggering and UJT driving circuit-Problems.

Unit 2 Protection circuits for power electronic devices 9

Specifications and Ratings of SCRs- Voltage and Current and power ratings-Two transistor analogy of SCR – Protection against dv/dt with design of Snubber circuit-di/dt Protection with help of inductor-Over voltage protection by Metal Oxide Varistors – Over current protection by fast acting current limiting fuse– Gate Protection-Improving dv/dt rating with the help of Cathode short-di/dt improvement by high gate current -cooling mechanism of SCR-Cooling and mounting of thyristors –Problems.

Unit 3 AC to DC Converters 9

Operation and analysis of Single phase and three phase uncontrolled and controlled rectifiers with R, RL and back EMF load-Derivation of average and RMS load voltage and current -Active and Reactive power inputs to the converters-Effect of freewheeling diode -Numerical problems-Effect of Source inductance on single phase and three phase fully controlled bridge rectifier with RL load–single phase and three phase Dual converters-power factor improvement methods for phase controlled rectifiers.

Unit 4 DC to DC Converters 8

Principle of buck converter, boost converter and buck boost converter operation with RLE load – Control strategies-Time ratio control& current limit control– Derivation of average load voltage, RMS voltage and load current for continuous current operation-ripple current-ripple factor-Numerical problems–Operation of Single quadrant (Type A or Type B) chopper -Two quadrant DC Chopper (Type C) and (Type D) and Four quadrant DC chopper (Type E)-AC chopper-Problems.

Unit 5 DC to AC and AC to AC Converters 9

Single phase inverters – Basic series inverter– Basic parallel inverter- Voltage Source Inverter & Current Source Inverter- Voltage control techniques of single phase inverters- External Control methods -Internal control methods-Pulse Width Modulation Techniques-single PWM–Multiple PWM and Sinusoidal PWM. Three phase Voltage source inverter for 180 deg mode.

AC voltage controllers – Single phase half wave and full wave type regulators with R and RL loads – Derivation of RMS load voltage, current and power factor –Numerical problems-Cyclo converters – Single phase midpoint and bridge configuration of cyclo converters with resistive and inductive loads- problems.

Text books:

1. M. D. Singh & K. B. Kanchandhani. *Power Electronics*, Tata McGraw Hill Publishing Company, Revised edition.
2. P.S.Bimbhra. *Power Electronics*, Khanna Publishers,2014.
3. Ned Mohan ,*Power Electronics,* second edition, john wiley&sonsInc.

Reference books:

1. Vedam Subramanyam,*Power Electronics*, 3rd Edition, New AgeInternational (P) Limited, 2008.M.H.Rashid, *Power Electronics Circuits Devices and Applications*. 3rdedition, Pearson, 2014.
2. John G. Kassakian, Martin F. Schlecht and George.C.Verghese. *Principles of Power Electronics*, Pearson Edition, 2010.
3. P.C. Sen,*Power Electronics*, Tata McGraw-Hill Publishing Company, 2014.

| Course Outcome At the end of the course the student will be able to | Bloom's Level |
|---|---|
| 1. Understand the characteristics of different types of semiconductor devices. | L2 |
| 2. Analyze the driving circuits & protection circuits of Power electronic device. | L4 |
| 3. Analyze the operation of Power electronic AC to DC converters. | L4 |
| 4. Design of DC to DC converters. | L5 |
| 5. Design of DC to AC converters and AC to AC converters. | L5 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $PO_1$ | $PO_2$ | $PO_3$ | $PO_4$ | $PO_5$ | $PO_6$ | $PO_7$ | $PO_8$ | $PO_9$ | $PO_{10}$ | $PO_{11}$ | $PO_{12}$ | $PSO_1$ | $PSO_2$ |
| 19A252T.1 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 1 | - |
| 19A252T.2 | | 3 | - | 2 | 2 | - | - | - | - | - | - | - | - | - |
| 19A252T.3 | 3 | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 1 | - |
| 19A252T.4 | 3 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| 19A252T.5 | 3 | - | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCESRAJAMPET**
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Title of the course : Power System Analysis
Category : PC
Course Code : 19A253T
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course objectives:

- To know the formation of $Y_{bus}$ and $Z_{bus}$ for Power flow studies.
- To calculate Load flows by using various Methods.
- To model and analyze the power system under abnormal conditions
- To Model and analyze power system for steady state and transient stability.

Unit 1 Power System Network Matrices: 10
Representation of Power system elements. Bus Incidence Matrices. $Y_{br}$ and $Z_{loop}$ formation using singular transformation method. $Y_{bus}$ formation by Direct and Singular Transformation Methods. Formation of $Z_{Bus}$: Partial network, Algorithm for the Modification of $Z_{Bus}$ Matrix for addition of elements (Type-1 modification to Type 4 Modification) - Derivations and Numerical Problems. Modification of $Z_{Bus}$ for the changes in network (Problems).

Unit 2 Power Flow Studies: 10
Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, Algorithm. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.
Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Buses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods. - Comparison of Different Methods.

Unit 3 Short Circuit Studies: 9
Per Unit system of representation. Per-unit equivalent reactance network of a three phase power system.
Symmetrical Component Transformation, positive, negative and zero sequence components: Voltages, Currents and Impedance Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Symmetrical fault analysis: Short circuit Current and MVA Calculations, Application of Series Reactors. Need for current limiting reactors and their location The selection of circuit breakers.
Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without impedance, Numerical Problems.

Unit 4 Power System Steady State Stability Analysis: 8
Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability.

Unit 5 Power System Transient State Stability Analysis: 9
Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion-sudden change in mechanical input, sudden loss of one of parallel lines, sudden short circuit on one of parallel lines, Critical Clearing Angle Calculation - Solution of Swing equation by point by point method -modified Euler's method-Multi machines stability- Methods to improve Stability.

Prescribed Text Books:

1. Stagg & El – Abiad. Computer Methods in Power Systems. McGraw-hill Edition.
2. I.J.Nagrath&D.P.Kothari. Modern Power system Analysis. 4th edition. Tata McGraw-Hill Publishing Company, 2011.

Reference Books:

1. K.Umararao Computer Techniques and Models in power systems, I.K.International Publishing house Pvt.Ltd.2007
2. Grainger and Stevenson. Power System Analysis. Tata McGraw Hill. 2003.
3. M A Pai. Computer Techniques in Power System Analysis. 2nd Edition. Tata McGraw Hill. 2006.
4. Glovar and Sarma. Power System Analysis.4 th Edition Thomson Publishers. 2008.
5. Hadi&Sadath. Power System Analysis. Tata McGraw Hill. 2004.
6. B.R.Gupta. Power System Analysis and Design. 6th Revised Edition. S. Chand & Co. 2010.

| Course outcomes: At the end of the course the student will be able to | Blooms Level |
|---|---|
| 1. Formulate the mathematical modeling of power system. | L2 |
| 2. Perform load flow computations and analyze the load flow results | L5 |
| 3. Analyze different faults in a power system | L3 |
| 4. Create Computational models for analysis of both symmetrical and Unsymmetrical conditions in power systems. | L4 |
| 5. Know the steady state stability status of the power system. | L2 |
| 6. Know the transient state stability status of the power system | L2 |

CO-PO-PSO Mapping

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A253T.1 | 3 | 1 | 1 | - | 2 | - | - | - | - | 1 | 1 | 1 | 3 | 3 |
| 19A253T.2 | 2 | 1 | 1 | - | 1 | - | - | - | - | 1 | 1 | 1 | 3 | 3 |
| 19A253T.3 | 3 | 2 | 3 | - | 3 | - | - | - | - | 1 | 2 | 1 | 3 | 3 |
| 19A253T.4 | 2 | 2 | 2 | - | 3 | - | - | - | - | 1 | 3 | 1 | 3 | 3 |
| 19A253T.5 | 1 | 1 | 2 | - | 3 | - | - | - | - | 1 | 2 | 1 | 3 | 3 |
| 19A253T.6 | 1 | 1 | 2 | 2 | 2 | - | - | - | - | 1 | 1 | 1 | 3 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
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Title of the Course: Digital Control Systems
Category : PE
Course Code : 19A25AT
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To explain basic and digital control system for the real time analysis and design of control systems.
- To apply the knowledge state variable analysis in the design of discrete systems.
- To explain the concept of stability analysis and design of discrete time systems.

UNIT 1 Introduction 9

Block Diagram of typical control system- advantages of sampling in control systems – examples of discrete data and digital systems – data conversion and quantization – sample and hold devices – D/A and A/D conversion – sampling theorem – reconstruction of sampled signals – ZOH. Z-transform: Definition and evaluation of Z-transforms – mapping between s-plane and z-plane – inverse z-plane transform – theorems of the Z-transforms –limitations of z-transforms – pulse transfer function –pulse transfer function of ZOH –relation between G(s) and G(z) – signal flow graph method applied to digital systems.

UNIT 2 State Space Analysis 9

State space modeling of digital systems with sample and hold – state transition equation of digital time in variant systems – solution of time in variant discrete state equations by the Z-Transformation – transfer function from the state model – Eigen values – Eigen vector and diagonalization of the matrix – Jordan canonical form. Computation of state transition matrix-Transformation to phase to variable canonical form-The state diagram – decomposition of digital system – Response of sample data system between sampling instants using state approach. Stability: Definition of stability – stability tests – The second method of Lyapunov.

UNIT 3 Time Domain Analysis 10

Comparison of time response of continuous data and digital control systems-correlation between time response and root locus j the s-plane and z-plane – effect of pole-zero configuration in the z-plane upon the maximum overshoot and peak time of transient response – Root loci for digital control systems – steady state error analysis of digital control systems – Nyquist plot – Bode plot-G.M and P.M.

UNIT 4 Design 8

The digital control design with digital controller with bilinear transformation – Digital PID controller-Design with deadbeat response-Pole placement through state feedback-Design of full order state observer-Discrete Euler Lagrange Equation – Discrete maximum principle.

UNIT 5 Digital State Observer 8

Design of – Full order and reduced order observers. Design by max. Principle: Discrete Euler language equation-discrete maximum principle.

Prescribed Text Books:

1. Discrete-Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition 2012.
2. Digital Control and State Variable Methods by M. Gopal, TMH. 4th Edition 2012

Reference books:

1. Digital Control Systems, Benjamin C. Kuo, Oxford University Press, 2nd Edition, 2012.
2. Digital Control Engineering, M. Gopal, new age publishers 2nd Edition, 2014.

Course outcomes: At the end of the course the student will be able to — Blooms Level

1. Understand the concepts of Digital control systems — L1
2. Analyze and design discrete systems in state variable analysis. — L3
3. Relate the concepts of stability analysis and design discrete time systems. — L3

CO-PO-PSO Mapping

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A25AT.1 | - | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 3 | 3 | 2 | 1 |
| 19A25AT.2 | - | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 3 | 3 | 2 | 1 |
| 19A25AT.3 | - | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 3 | 3 | 2 | 1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET**

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| | |
|---|---|
| Title of the Course | Renewable Energy Systems |
| Category | PE |
| Course Code | 19A25 BT |
| Year | III B.Tech |
| Semester | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To create awareness among the students about the different types of Renewable Energy sources and emphasize its importance.

Unit 1 Renewable energy sources 10

RENEWABLE ENERGY SOURCES: Renewable and Non renewable energy sources, Importance of renewable sources of energy, Types of renewable energy sources, Potential of renewable energy sources, Limitations of renewable energy sources.

PRINCIPLES OF SOLAR RADIATION 9

Environmental impact of solar power, Spectral distribution of solar energy, the solar constant, solar radiation-direct beam ,diffuse radiation and reflected radiation, solar radiation on tilted surface, instruments for measuring solar radiation-pyranometer, pyrheliometer and sun shine recorder, solar radiation data

Unit 2 Solar energy collection and its applications 10

Solar energy collection and its applications: Flat plate and concentrating collectors, classification of concentrating collectors, advanced collectors.

Energy Storage: necessity of energy storage methods-, Sensible, latent heat and thermo chemical storage.

Solar Applications- solar heating/cooling technique, solar distillation, solar ponds and drying, photovoltaic energy conversion, solar pumping and solar furnaces.

Unit 3 Wind energy 10

Introduction, Wind and its Properties, site selection consideration, Basic principles of Wind Energy Conversion Systems (WECS),Parts of WECS, types of wind machines Classification of WECS, modes of wind power generation, Derivation for Power in the wind, energy storage, performance characteristics of wind machines, applications , Advantages and Disadvantages of WECS

Unit 4 Ocean energies 10

OCEAN ENERGIES: Ocean thermal energy sources, Ocean thermal energy power plant development, Closed and open cycles. Advantages and operating difficulties.

Tidal energy: tidal characteristics, tidal energy estimation, types of tidal power plants, advantages and disadvantages.

Wave energy: properties of waves, Factors affecting wave energy, wave energy conversion machines,

device applications

Unit 5 Bio-mass and geothermal energy 10

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas and economic aspects.

Geothermal Energy: Geothermal field, Resources, types of wells, methods of harnessing the energy, potential in India

Fuel cell : Principle of working- various types -construction and applications

Prescribed Text Books

1. G.D. Rai. Non-Conventional Energy Sources. Khanna Publishers, Delhi, 2007.
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi,2006

Reference Books:

1. Twidell&Wier, Renewable Energy Resources , CRC Press( Taylor & Francis)
2. Ramesh & Kumar, Renewable Energy Technologies ,Narosa.
3. K Mittal, Non-Conventional Energy Systems, Wheeler
4. D.P.Kothari, K.C.Singhal, Renewable energy sources and emerging technologies, Prentice Hall Iindia.
5. G.D. Rai, Solar Energy Utilization, Khanna Publishers, Delhi, 2001.
6. G.N.Tiwari and M.K. Ghosal. Fundamentals of Renewable energy resources. Narosa, New Delhi, 2007.
7. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning.

Course outcomes: At the end of the course the student will be able to Blooms Level

1. Find different renewable energy sources to produce electric power L1
2. Understand the basic concepts of solar radiation and its measurements L2
3. Understand different types of solar collectors and its applications. L2
4. Explain design of wind energy conversion systems L1
5. Explain the principle of operation of miscellaneous renewable energy sources. L1

COs-POs-PSOsMapping

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27AT .1 | 3 | - | 2 | 3 | - | 2 | 3 | - | - | 2 | 3 | - | 3 | 2 |
| 19A27AT .2 | 3 | - | 3 | - | 3 | - | - | - | - | 3 | - | 3 | 3 | - |
| 19A27AT .3 | 3 | 3 | 3 | - | 3 | - | 3 | - | 3 | 3 | - | 3 | 3 | - |
| 19A27AT .4 | 3 | - | 3 | - | 3 | - | - | - | - | 3 | - | 3 | 3 | - |
| 19A27AT .5 | 3 | 3 | 3 | - | 3 | 3 | - | - | - | 3 | - | 3 | 3 | 3 |

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Title of the Course : Modern Control Theory
Category : PE
Course Code : 19A25CT
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives

- To explain the concepts of basic and modern control system for the real time analysis and design of control systems.
- To explain the concepts of state variables analysis.
- To study and analyze non linear systems.
- To analyze the concept of stability for nonlinear systems

UNIT 1 Mathematical Preliminaries and State Variable Analysis: 10
Fields, Vectors and Vector Spaces – Linear combinations and Bases – Linear Transformations and Matrices – Scalar Product and Norms – Eigen values, Eigen Vectors and a Canonical form representation of Linear systems – The concept of state – State space model of Dynamic systems – Time invariance and Linearity – Non uniqueness of state model – State diagrams for Continuous-Time State models – Existence and Uniqueness of Solutions to Continuous-Time State Equations – Solutions of Linear Time Invariant Continuous-Time State Equations – State transition matrix and it's properties. Complete solution of state space model due to zero input and due to zero state.

UNIT 2 Controllability and Observability: 9
General concept of controllability – Controllability tests, different state transformations such as diagonalization, Jordon canonical forms and Controllability canonical forms for Continuous-Time Invariant Systems – General concept of Observability – Observability tests for Continuous-Time Invariant Systems – Observability of different State transformation forms.

UNIT 3 State Feedback Controllers and Observers: 8
State feedback controller design through Pole Assignment, using Ackkermans formula– State observers: Full order and Reduced order observers.

UNIT 4 Non-Linear Systems: 9
Introduction – Non Linear Systems – Types of Non-Linearities – Saturation – Dead-Zone – Backlash – Jump Phenomenon etc; Linearization of nonlinear systems, Singular Points and its types– Describing function–describing function of different types of nonlinear elements, – Stability analysis of Non-Linear systems through describing functions. Introduction to phase-

plane analysis, Method of Isoclines for Constructing Trajectories, Stability analysis of nonlinear systems based on phase-plane method.

UNIT 5 Stability Analysis: 8

Stability in the sense of Lyapunov, Lyapunov's stability, and Lypanov's instability theorems – Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasooviski's method.

TEXT BOOKS:

1. M. Gopal, Modern Control System Theory by – New Age International -2014 3rd Edition.
2. Modern Control Engineering by Choudhury, D. Roy – Prentice Hall – 2015
3. N K Sinha, Control Systems– New Age International – 4th edition 2013.

REFERENCE BOOKS:

1. Donald E. Kirk, Optimal Control Theory an Introduction, Prentice – Hall Network series – First edition.

| Course Outcomes: At the end of the course the student will be able to | Blooms Level |
|---|---|
| 1. analyze various terms of basic and modern control system and design of control systems | L3 |
| 2. examine a system for its controllability, and observability. | L3 |
| 3. convert nonlinear systems to linear systems | L2 |
| 4. examine stability of a system | L3 |

COs-POs-PSOs Mapping Table

| Course | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outcomes | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A25CT.1 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 | 1 |
| 19A25CT.2 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 | 1 |
| 19A25CT.3 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 | 1 |
| 19A25CT.4 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 | 1 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
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Title of the course : Fuzzy Logic and Neural Network
Category : OE
Course code : 19A25DT
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical Hours | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives

- To understand the concepts of classical sets Fuzzy sets
- To understand the concepts Fuzzy logic controllers
- To understand the fundamental concepts of Artificial Neural network
- To Understand the concepts of different types Neural network architectures and training algorithms
- To gain knowledge in neuro- fuzzy control and its applications in power systems

Unit 1 Classical and Fuzzy sets 08

Introduction to classical sets, Fuzzy sets – Properties, Operations and Relations, Membership, Uncertainty, Fuzzy Relations, Cardinalities and Membership Functions.

Unit 2 Fuzzy Logic system and components 10

Fuzzification, Membership Value assignment, Development of Rule Base, Defuzzification to crisp sets, Defuzzification methods

Unit 3 Introduction to Artificial Neural Networks 12

Introduction, Biological Neuron, Biological Artificial Neuron model , Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of neural networks , Historical developments, Neural network architectures, McCulloch-Pitts Model, Types of neuron activation functions, Learning methods(supervised, unsupervised, Reinforcement), Applications of Neural Networks.

Unit 4 Single layer and multi layer feed forward neural networks 12

Perceptron Models: Discrete, Continuous (concepts only), Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer, Hidden Layer and output Layer computations, Radial Basis function network, Hetero associative memory neural and Auto associative memory net, applications.

Unit 5 Neural network and fuzzy logic applications to Power system 10

ANN Based Short Term Load Forecasting, Load Flow Studies, Fault diagnosis and Fuzzy Logic based Unit Commitment and load frequency control.

Text Books:

1. S.N.Sivanadam, S.N.Deepa *Principles of Soft Computing Techniques* , Wiley India publication.
2. JacekM.Zurada*Introduction to Artificial Neural Systems*, Jaico Publishing House, 1997.

Reference Books:

1. N. Yadaiah and S. BapiRaju, *Neural and Fuzzy Systems*: *Foundation, Architectures and Applications*, Pearson Education
2. James A Freeman and Davis S kapura, *Neural Networks* ,Pearson, 2002
3. BrokKosko, *Neural Networks and Fuzzy Logic System* , , PHI Publications
4. Rajasekharan and Rai, *Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications* - PHI Publication.

| Course Outcomes :By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. Understand fuzzy concepts and fuzzy logic components | L2 |
| 2. analyze and form neural networks for different Problems | L4 |
| 3. Get the knowledge of different types of neural networks | L1 |
| 4. apply neural networks for electrical Systems. | L3 |
| 5. apply fuzzy logic for electrical Systems | L3 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A25DT.1 | 2 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 1 | 1 | 1 | 1 |
| 19A25DT.2 | 2 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 2 | 2 | 2 | 2 |
| 19A25DT.3 | 2 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 2 | - | - | 2 |
| 19A25DT.4 | 2 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | - | 3 | 2 | - |
| 19A25DT.5 | 2 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 2 | 2 | 2 | 2 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET

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Title of the Course : Battery Energy Storage Systems
Category : OE
Course Code : 19A25ET
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To enable the student to understand the need for Energy Storage.
- To learn sufficient knowledge about various Energy Storage Technologies.
- To deal with grid connected Battery Energy Storage System.
- To study the Challenges, Risk and Policy of Battery Energy Storage Systems.

Unit 1 Introduction to Energy Storage for Power Systems 10

Emerging needs for Electrical Energy Storage -Role of Energy Storage Systems-Applications. Overview of energy storage technologies: Thermal, Mechanical, Chemical, Electrochemical, Electrical-Efficiency of Energy Storage Systems

Unit 2 Energy Storage Technologies 10

Storage Types - Components of a Battery Energy Storage Systems (BESS) - Energy Storage System Components -Grid Connection for Utility-Scale BESS Projects -Battery Chemistry Types -Lead–Acid (PBA) Battery - Nickel–Cadmium (Ni–Cd) Battery-Lithium-Ion (Li-Ion) Battery.

Unit 3 Grid Applications of Battery Energy Storage Systems 8

Scoping of BESS Use Cases - General Grid Applications of BESS -Technical Requirements - Round-Trip Efficiency - Response Time - Lifetime and Cycling - Sizing - Operation and Maintenance.

Unit 4 Challenges and Risks 9

Grid Tariff Applications and Licensing Issues -Battery Safety - Challenges of Reducing Carbon Emissions - Battery Recycling and Reuse Risks -Examples of Battery Reuse and Recycling - Reuse of Electric Vehicle Batteries for Energy Storage - Recycling Process.

UNIT 5 Policy Recommendations 8

Frequency Regulation - Renewable Integration -Distribution Grids -Transmission Grid–PeakShaving and Load Leveling - Microgrids

Prescribed Text Books:

1. YongpingZhai. Handbook on Battery Energy Storage SystemAsian Development Bank.2018.
2. James M. Eyer, Joseph J.Iannucci and Garth P. Corey .Energy Storage Benefits and Market Analysis, Sandia National Laboratories, 2004.
3. Jim Eyer, Garth Corey", Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

Reference Books:

1. Doughty, D. H., and E. Peter Roth. 2012. A General Discussion of Li Ion Battery Safety. Electrochemical Society Interface 21 (2): 37–44. DOI: 10.1149/2.F03122if.
2. Electric Power Research Institute (EPRI). 2010. Electricity Energy Storage Technology Options: A White Paper Primer on Applications, Costs, and Benefits. Palo Alto, California, US. http://large. stanford.edu/courses/2012/ph240/doshay1/docs/EPRI.pdf

| Course outcomes: By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. Understanding the need of the Energy Storage Systems. | L2 |
| 2. Study and Analyze the function of each storage Technology, its types. | L2 & L4 |
| 3. Explore the battery energy storage applications in Renewable Energy Systems and in Smart grid. | L2 |
| 4. Study the challenges, risk and policy recommendations of Battery Energy Storage Systems. | L2 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 2 | 1 |
| 19A25ET .1 | 2 | - | - | 1 | - | - | 1 | - | 1 | - | - | - | 1 | - |
| 19A25ET .2 | 2 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | - |
| 19A25ET .3 | 2 | 1 | 1 | 1 | - | - | 1 | - | 2 | - | - | - | 1 | 1 |
| 19A25ET .4 | 2 | 1 | 1 | 1 | - | - | 2 | - | 1 | - | - | - | 2 | 1 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
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Title of the course: System Modeling and Simulation
Category : OE
Course code : 19A25FT
Year : III B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical Hours | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives

- To understand the basic system concepts and definitions of system.
- Techniques to model and to simulate various systems.
- To analyze a system and to make use of the information to improve the performance

Unit 1 Introduction to simulation models 10

Basic Simulation Modeling, Systems, Advantages and disadvantages of simulation, Models and Simulation, Discrete Event Simulation, Simulation of Single Server Queuing System, Simulation of Inventory System, Alternative approach to Modeling and Simulation

Unit 2 Simulation software 10

Comparison of Simulation Packages with Programming Languages, Classification of Software, Desirable Software Features, General Purpose Simulation Packages – Arena, Extend and Others, Object Oriented Simulation, Examples of Application Oriented Simulation Packages.

Unit 3 Building simulation models and time driven simulation models 08

Guidelines for Determining Levels of Model Detail, Techniques for Increasing Model Validity and Credibility, Modeling Time Driven Systems: Modeling Input Signals, Delays, System Integration, Linear Systems, Motion Control Models, Numerical Experimentation.

Unit 4 Exogenous signals and events and markov Process 12

Disturbance Signals, State Machines, Petri Nets & Analysis, System Encapsulation,
MARKOV Process: Probabilistic Systems, Discrete Time Markov Processes, Random Walks, Poisson Processes, the Exponential Distribution, Simulating a Poison Process, Continuous-Time Markov Processes.

Unit 5 Event driven models and system optimization 10

Simulation Diagrams, Queuing Theory, characteristics of queuing system, Simulating Queuing Systems, Types of Queues, Multiple Servers, System Identification, Searches, Multi dimensional Optimization, Modeling and Simulation Mythology.

Prescribed Text Books:

1. System Modeling & Simulation, an Introduction – Frank L. Severance, John Wiley & Sons, 2001.
2. Simulation Modeling and Analysis – Averill M. Law, W. David Kelton, TMH, 3rd Edition, 2003.

Reference Book:

1. Systems Simulation – Geoffrey Gordon, PHI, 1978.

| Course outcomes: By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. Define basic concepts in Modeling and Simulation. | L1 |
| 2. Understand the fundamental logic, structure, components and management of simulation modeling& demonstrate knowledge of how to use arena | L2 |
| 3. Classify various simulation models and give practical examples for each category | L2 |
| 4. Generate and test random number variates and apply them to develop simulation models | L5 |
| 5. Analyze output data produced by a model and test validity of the model. | L4 |
| 6. Perform statistical analysis of output from terminating simulation | L5 |

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Mapping of COs and POs:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A25FT .1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | 1 | 1 |
| 19A25FT .2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | - | 2 | 2 |
| 19A25FT .3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 |
| 19A25FT .4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | 2 | - |
| 19A25FT .5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | 2 | 2 |
| 19A25FT .6 | 3 | 3 | 3 | 3 | 3 | 2 | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

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| | |
|---|---|
| Title of the Course | : Electrical Measurements Lab |
| Category | : PC |
| Course Code | : 19A254L |
| Year | : III B.Tech |
| Semester | : I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | 2 | 1 |

Any **Ten** of the following experiments are to be conducted

1. Calibration and Testing of 1-Φ energy Meter.
2. Calibration of dynamometer type power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin‘s double Bridge, Wheatstone Bridge – Measurement of resistance
5. Measurement of % ratio error and phase angle of given C.T. by Silsbee’s method.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3-Φ reactive power with 1-Φ wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
9. Calibration of wattmeter – by Phantom testing.
10. Dielectric oil testing using H.T. testing Kit.
11. Measurement of frequency by Wien’s Bridge.
12. Measurement of iron loss in a bar specimen using a CRO and using a wattmeter.
13. Measurement of High resistance and Insulation resistance using Megger.
14. Download of one-cycle data of a periodic waveform from a DSO and use values to compute the RMS values using a C program.
15. Usage of DSO for steady state periodic waveforms produced by a function generator. Selection of trigger source and trigger level, selection of time-scale and voltage scale. Bandwidth of measurement and sampling rate.

| Course outcomes: By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. Evaluate the absolute error of measuring instruments (Wattmeter, Power factor meter, Energy meter, CT testing | L6 |
| 2. Evaluate the electrical circuit parameters(R,L,C, choke coil parameters, Megger) | L6 |
| 3. Evaluate the electrical system parameters (3-Φ active, reactive power and frequency | L6 |
| 4. Evaluate the dielectric strength of the oil. | L6 |
| 5. Understand statistical data analysis and data acquisition | L2 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A254L.1 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| 19A254L.2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 |
| 19A254L.3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 |
| 19A254L.4 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| 19A254L.5 | 1 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - |

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Title of the Course :Control Systems And Simulation Lab
Category :PC
Course Code :19A255L
Year :III B.Tech
Semester :I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | 2 | 1 |

Any Ten of the following experiments are to be conducted

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.
12. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
13. Stability analysis (Bode, Root Locus, Nyquist) of LTI system using MATLAB.
14. State space model for classical transfer function using MATLAB – Verification.
15. Effect of P-PI-PID controller on level processing unit.

| Course outcomes: By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. find time response of given control system model | L3 |
| 2. formulate transfer function for given system | L2 |
| 3. Analyze the effect of feedback, P, PD, PI, PID Controller on systems | L2 |
| 4. apply Programmable logic controller | L3 |
| 5. design Lead, Lag, Lead-Lag controllers | L4 |
| 6. Analyze Stability of a given system using different methods | L3 |
| 7. apply concept of state space to a system | L3 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A255L.1 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | 2 | 1 |
| 19A255L.2 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | - | - |
| 19A255L.3 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | 2 | 1 |
| 19A255L.4 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | 2 | 1 |
| 19A255L.5 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | 2 | 1 |
| 19A255L.6 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | - | - |
| 19A255L.7 | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | 2 | 1 |

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| | |
|---|---|
| Title of the Course | Professional Communication Skills Lab |
| Category | HS |
| Course Code | 19AC52L |
| Year | III B.Tech |
| Semester | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | 3 | 1.5 |

Résumé Preparation – structure, formats and styles – planning - defining career objective - projecting one's strengths and skills - creative self-marketing–sample resumes - cover letter

Interview Skills- concept and process - pre-interview planning – preparation - body language - answering strategies – frequently asked questions

Group Discussion –communicating views and opinions – discussing – intervening – agreeing and disagreeing –asking for and giving clarification - substantiating - providing solution on any given topic across a cross-section of individuals - modulation of voice and clarity - body language – case study

Oral Presentations (Individual& Team) – collection of data from various sources –planning, preparation and practice – attention-gathering strategies - transitions – handling questions from audience

Listening Comprehension – listening for understanding - responding relevantly

Learning Resources: AECS Lab Manual prepared by Dept of HS, AITS Rajampet

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. express himself/herself fluently in social and professional contexts | L4 |
| 2. demonstrate effective presentation skills | L4 |
| 3. face interviews confidently | L3 |
| 4. participate in meetings effectively | L4 |
| 5. listen actively for better understanding | L4 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19AC52L/62L.1 | | | | | | | | | | 3 | | 3 | | | |
| 19AC52L/62L.2 | | | | | | | | | | 3 | | 3 | | | |
| 19AC52L/62L.3 | | | | | | | | | | 3 | | 3 | | | |
| 19AC52L/62L.4 | | | | | | | | | | 3 | | 3 | | | |
| 19AC52L/62L.5 | | | | | | | | | | 3 | | 3 | | | |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET**
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| | | |
|---|---|---|
| Title of the Course | : | Microprocessors And Microcontrollers |
| Category | : | PC |
| Course Code | : | 19A261T |
| Year | : | III B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objective:**

- To understand the hardware and software details of 8086 microprocessor and 8051 micro controller and their interfacing with memory and I/O devices
- Programming knowledge on the above to implement real time projects.

Unit 1 8086 Architecture and Programming: 15

Architecture of 8086 microprocessor, Register organization, Memory organization, Pin diagram, Minimum mode and maximum mode of operation, Timing diagrams. Machine language instruction formats, addressing modes, instruction set. Assembler directives, Assembly language programs involving logical, branch and call instructions, sorting, string manipulation. Procedure and Macros.

Unit 2 Data Transfer Methods And I/O Interfacing Of 8086: 10

Programmed I/,O Interrupt driven I/O,DMA ,Need for DMA, Architecture of 8257, Architecture of 8255 PPI and its various modes of operation.

I/O Interfacing methods – I/O mapped I/O, Memory mapped I/O .8255 interfacing to 8086, Interrupt structure of 8086, Vector interrupt table. Interrupt service routines. 8259 PIC architecture.

Unit 3 Communication Interface: 10

Asynchronous and synchronous data transfer schemes. Necessity of communication interfaces, 8251 USART architecture and interfacing. Serial communication standard-RS-232C, TTL to RS232C and RS232C to TTL conversion.

Unit 4 8051 Microcontroller: 10

Architecture of 8051, pin diagram, memory organization, Addressing modes, instruction set, simple Programs, Timers/Counters, Serial Communication features, Interrupts.

Unit 5 Advanced Microcontrollers: 10

The ARM Architecture, ARM7, ARM9, Features and applications of ARM.

ARDUINO: Block diagram, Architecture, Pin functions, overview of main features such as I/O Ports, Timers, interrupts serial port, PWM, ADC.

Text Books:

1. A.K. Ray and K.M.Bhurchandi. *Advanced microprocessors and peripherals*. 3rd edition. TMH. 2013.
2. Muhammad Ali Mazidi. 8051 *Microcontroller and embedded systems using assembly and c*.2nd edition, Pearson Eduction. 2008.
3. Barry B.BreyThe Intel microprocessors architecture, programming and interfacing.8th edition, Pearson Education. 2009.

Reference Books:

1. Douglas V.Hall. *Microprocessors and Interfacing*. 2nd edition,TMH, 2007.

| Course outcomes: By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. Analyze the hardware design of 8086 microprocessor and is able to write assembly language programs. | L3 |
| 2. Understand the programmable (8255-PPI) and non programmable interfacing methods of 8086. | L2 |
| 3. Learn the interrupt programming of 8086 microprocessor. | L1 |
| 4. Know the basic communication methods and communication interfacing programming of 8086 microprocessor. | L1 |
| 5. Identify the difference between 8086 microprocessor based system design, 8051 microcontroller and advanced microcontroller based system design. | L2 |

COs-POs-PSOs Mapping Table

| Course | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outcomes | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A261T.1 | 2 | - | - | - | 2 | - | - | - | - | 2 | - | 2 | 2 | 2 |
| 19A261T.2 | 2 | - | 2 | 2 | 2 | - | - | - | - | - | - | 2 | - | 2 |
| 19A261T.3 | 2 | - | - | 2 | 2 | - | - | - | 2 | - | - | 2 | 2 | - |
| 19A261T.4 | - | - | - | - | - | - | - | - | - | 2 | 2 | 2 | 2 | 2 |
| 19A261T.5 | - | - | 2 | 2 | 2 | - | - | - | 2 | - | 2 | 2 | - | 2 |

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| | | |
|---|---|---|
| Title of the Course | : | Power System Operation And Control |
| Category | : | PC |
| Course Code | : | 19A262T |
| Year | : | III B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 2 | - | - | 2 |

Course Objectives:

- To familiarize the students with economic operation of power systems.
- To provide knowledge about modeling of Power Plant Components.
- To prepare the students to realize the need of controlling the frequency, voltage and reactive power in a power system.

Unit 1 Optimal operation of power generating systems: 10

Thermal (Input-Output- Heat rate Curve - Cost Curve- Incremental Fuel Cost -Incremental Production Cost ), Optimal operation of Generators in Thermal Power Stations without losses (with and without generating limits)-Optimum Generation Allocation with Line Losses- Penalty factor - Loss Coefficients, General transmission line loss formula, Numerical Problems.

Unit 2 Short term Hydro-thermal Scheduling and Unit Commitment: 8

Hydroelectric power plant models,short term Hydro thermal scheduling problem

UnitCommitment - Unit Commitment vs Economic Dispatch- Constraints in unit commitment start-up and shut-down costs, up time and down time constraints

Unit commitment solution methods - Priority-List method, Dynamic Programming method(only Theory)

Unit 3 Modeling of power plant components: 8

First order Turbine modelBlock Diagram representation of Steam Turbines and Approximate Linear Models.

Modeling of Speed Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function.

Modeling of Generator- load system: Transfer function, Block Diagram Representation ofGenerator - load model &Block Diagram Representation of Single area system.

Unit 4 Load frequency control: 10

Necessity of keeping frequency constant. Definitions of Control area

Single area controlLoad Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases

Two-area system: LFC of two area system – tie line modeling – block diagram representation of two area system – static and dynamic analysis – tie line with frequency bias control

Load Frequency Controllers: Proportional plus Integral control of single area and two area systems & its block diagram representation, steady state response – integration of economic dispatch control with LFC.

Unit 5 Reactive power control: 8

Overview of Reactive Power control – Reactive Power compensation in transmission systems.
Line compensation: shunt and Series Compensation (Only using Passive Elements) - advantages and disadvantages of different types of compensating equipment for transmission systems.
Load compensation: Load compensation (simple problems) - Specifications of load compensator.

Prescribed Text Books:

1. Chakrabarthi and S. Halder, Power System Analysis Operation and Control , 3rd Edition, Prentice Hall India.
2. I.J. Nagrath& D.P. Kothari, Modern Power System Analysis , 4th Edition, Tata McGraw Hill.
3. C.L.Wadhwa, Electrical Power Systems , 4th Edition, New age International.

Reference Books:

1. S. Sivanagaru& G. Sreenivasan, Power System Operation and Control, 1st Edition,2009 Pearson Publications.
2. S.N. Singh, Electric Power Generation, transmission and Distribution , 2nd Edition, Prentice Hall India.
3. HadiSaadat, Power System Analysis , TMH Edition 3rd , 2011.

Course outcomes: By the end of this course, students will be able to — Blooms level

1. Explore the significance of optimal operation and scheduling of Hydro Thermal Systems — L2
2. Recognize the need of modeling and carry out the Load Frequency Control in Power Systems — L3
3. Identify the necessity of the Reactive Power Control in Transmission lines and Load End — L2

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 2 | 2 | 1 | 2 | - | - | 1 | - | - | - | - | 1 | 2 | 1 |
| 2 | 2 | 2 | 1 | - | 1 | - | 1 | - | - | - | - | - | 2 | 1 |
| 3 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | - | - | 1 | 1 | 1 | 1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET**

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Title of the course : Switch Gear and Protection
Category : PC
Course code : 19A263T
Year : III B.Tech
Semester : II

| Lecture | Tutorial | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives: Overview of protection schemes; Fuses and circuit breakers; Electromagnetic, static and microprocessor based relays; Protection schemes for various components under various operating conditions; Neutral grounding.

Unit 1 10

Circuit Breakers: Fuses-Types,ratings – Isolators.Circuit Breakers: Elementary principles of arc interruption, Restriking Voltage and Recovery voltages - Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

Unit 2 12

Electromagnetic And Static Relays And Microprocessor based relays: Electromagnetic relays: Introduction, types of relays, construction, operation and torque equation of induction type relays, differential relays and biased differential relays. Characteristics of over current, directional and distance relays (R-X).
Static relays: Advantages and disadvantages block diagram of a basic static relay, definite time, inverse and inverse definite minimum time (IDMT) static relays. Comparators - amplitude and phase comparators.
Microprocessor based relays: Advantages and disadvantages, block diagram with flow chart-distance relays and over current relays- definite, inverse & IDMT.

Unit 3 9

Protection of Generator And Transformer: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected.
Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection.

Unit 4 8

Protection of Feeders And Transmission Lines: Protection of Feeder (Radial & Ring main) using over current Relays. Protection of Transmission line – 3 Zone protection using Distance Relays, Carrier current protection, Protection of Bus bars.

Unit 5 10

Neutral Grounding And Protection Against Over Voltages:Grounded and Ungrounded Systems-Effects of Ungrounded Neutral on system performance, Methods of Neutral Grounding: Solid, Resistance, Reactance and Peterson coil grounding- Grounding Practices, Numerical Problems.
Protection against Over Voltages: Causes of over voltages in power systems, protection against lightning over voltages - non-linear (valve type) and metal oxide (zinc-oxide) surge arresters, Insulation coordination, basic impulse insulation level(BIL).

Prescribed Text Books:

1. Sunil S Rao , Switchgear and Protection , KhannaPubllishers
2. Badari Ram, D.N Viswakarma, Power System Protection and Switchgear TMH Publications.
3. Y. G. Paithankar and S. R. Bhide, Fundamentals of Power System Protection2nd Edition, PHI.

Reference Books:

1. Y.G. Paithankar, Taylor and Francis Transmission network Protection ,2009.
2. BhuvaneshOza ,Power system protection and switch gear , TMH, 2010.
3. C.L.Wadhwa , Electrical Power Systems , New Age international (P) Limited, Publishers, 3nd edition
4. Christopoulos and A. Wright, Electrical power System Protection 2nd Edition, Springer International Edition.

Course outcomes: By the end of this course, students will be able to Blooms level

1. Understand fuses and different circuit breakers. L1
2. Analyze different protective devices and protection schemes under various operating conditions. L3
3. Design proper protection scheme for different power system components. L3
4. Select and apply appropriate protective device and scheme for different scenarios. L2
5. Apply various grounding methods for safety of power system components and personal L4

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A263T.1 | - | - | 3 | - | 3 | 3 | - | - | - | - | - | - | 3 | 3 |
| 19A263T.2 | - | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 |
| 19A263T.3 | 3 | - | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - |
| 19A263T.4 | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - |
| 19A263T.5 | - | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 |

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| | | |
|---|---|---|
| Title of the Course | : | High Voltage Engineering |
| Category | : | PE |
| Course Code | : | 19A26AT |
| Year | : | III B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives: This course will able to

- Types of insulation systems
- Breakdown process in solid, liquid and gaseous dielectrics
- Generation of high AC and DC voltages, Impulse voltages and currents
- Measurement of high voltage, current, resistivity, dielectric constant and loss factor
- Testing of electrical apparatus

**Unit 1** Breakdown Phenomena 9

Introduction to High Voltage engineering, electrical field stresses.
Gaseous dielectrics: primary and secondary ionization processes, criteria for gaseous insulation breakdown mechanismTownsend's theory, streamer's theory, corona discharges, breakdown in electro negative gases, Paschen's law and its significance, time lags of breakdown.
Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown and electro mechanic breakdown.
Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown, electro convection breakdown.

Unit 2 8

Generation of HVAC: Need for cascade connection and working of transformer units connected in cascade; Series resonant circuit -principle of operation, Tesla coil.
Generation of HVDC: Voltage doubler circuit, Cockroft-walton type high voltage DC set, Vande-graaff generator, calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop.

Unit 3 Generation Of Impulse Voltage And Current 8

Introduction to standard lightning and switching impulse voltages, analysis of single stage impulse generator-expression for output impulse voltage. Multistage impulse generator - working of Marx impulse, rating of impulse generator, components of multistage impulse generator, triggering of impulse generator by three electrode gap arrangement, trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage and high impulse current.

Unit 4 Measurement Of High Voltages 8

Chubb and Fortescue method for HVAC measurement, generating voltmeter - Principle & construction. Series resistance micro ammeter for HVDC measurements, standard sphere gap measurements of HVAC, HVDC, and impulse voltages, factors affecting the measurements. Potential dividers-resistive, capacitance and mixed RC.Measurement of high impulse currentsrogowsky coil and magnetic Links.

Unit 5 High Voltage Tests On Electrical Apparatus 12

Measurement of DC resistivity, measurement of dielectric constant and loss factor, partial discharge measurements.Testing of electrical apparatus - insulators, bushings, isolators, circuit breakers, cables, transformers and surge arresters; radio interference measurements.

PrescribedText Books:

1. M.S. Naidu and V.Kamaraju, High Voltage Engineering, 5th edition, Tata McGraw-Hill Publications, 2013.
2. E.Kuffel, W.S.Zaengl and J.Kuffel, High Voltage Engineering: Fundamentals, 2nd edition,2005.

Reference books:

1. C.L.Wadhwa, High Voltage Engineering, 2nd edition, New Age International (P) Limited, 2007.
2. Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, RoshdyRadwan, High Voltage Engineering Theory and Practice, 2nd edition (Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).
3. L.L.Alston, High Voltage Technology, Oxford University Press, 1st Indian edition, 2011.

| Course outcomes: By the end of this course, students will be able to | Blooms level |
|---|---|
| 1. demonstrate knowledge on various insulation systems and their behavior under voltage stress, generation and measurement of high voltages and cur rents, testing of various high voltage electrical apparatus. | L1 |
| 2. analyze breakdown phenomenon in different insulation systems, circuits for generation of high voltage and currents, methods of measuring high voltage quantities. | L3 |
| 3. evaluate different parameters in high voltage engineering to provide valid conclusions. | L4 |
| 4. select suitable testing and diagnostic techniques for the high voltage apparatus | L2 |
| 5. apply contextual knowledge of high voltage engineering to sustain industrial needs | L4 |

CO-PO –PSO Mapping:

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A26AT.1 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | 3 | - |
| 19A26AT.2 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | - |
| 19A26AT.3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | - | 3 | - |
| 19A26AT.4 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | - | - | 3 |
| 19A26AT.5 | 3 | 3 | 3 | - | 3 | - | - | - | - | - | - | - | 3 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
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Title of the Course: Electrical Machine Design
Category : PE
Course Code : 19A26BT
Year : III B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objective: The goal of this course is to provide advanced knowledge and understanding about the construction and design of the electrical machines. The course provides to the students the basis and the methodologies to a correct design of the electrical machines (Transformers, Rotating machines). The applying knowledge and understanding capabilities will allow at the graduate to approach the problem linked to the design of the electrical machines.

Unit 1 Magnetic Circuit Design: 10
Calculation of field ampere turns - air gap mmf - effect of slot and ventilating duct - active iron length - mmf for teeth - real and apparent flux densities - mmf per pole - Magnetic Leakage Calculation- Effects of Leakage, Armature Leakage – Components.

Unit 2 Design of Transformer 10
: Output equation - Output rating of single phase and three phase transformers - Design of core - Design of winding (No. of turns) – Design of tank - Current density – Conductor section – Cooling of transformer.

Unit 3 Design of Dc Machines: 12
Output equation - specific loading - choice of speed and no of poles - calculation of main dimensions - choice of type of winding - number of slots - number of conductors per slot-current density - Length of air gap - design of field winding - conductor cross section - height of pole

Unit 4 Design of Induction Machines: 11
Main dimensions - stator design - squirrel cage and slip ring types - number of stator and rotor slots - rotor bar current - design of rotor bar - end ring current - design of end ring - design of slip ring rotor winding

Unit 5 Design of Synchronous Machines: 12
Specific loading - output equation - main dimensions - types of winding - number of turns - number of slots and slot design - field design for water wheel and turbo alternators - cooling of alternators.

PrescribedText Books:

1. A.K Sawhney, " A Course in Electrical Machine Design", Dhanpatraiand sons, Delhi.

Reference Books:

1. M. V. Deshpande, " Design and Testing of Electrical Machines", Wheeler Publishing.
2. R. . K. Agarwal, " Principles of Electrical Machine Design", Essakay Publications, Delhi.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Design the magnetic circuits. | L4 |
| 2. Understand the design concepts of transformers and know about how to design the parts. | L2 |
| 3. Design squirrel cage and slip-ring rotors of poly phase induction motor | L6 |
| 4. Understand the basic components of design of Synchronous Machine | L2 |

COs-POs-PSOs Mapping :

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A26BT .1 | 1 | 2 | 2 | - | - | - | - | - | - | - | - | - | 1 | - |
| 19A26BT .2 | 2 | 1 | - | - | - | 2 | 1 | - | - | - | - | - | 2 | - |
| 19A26BT .3 | 2 | 2 | 2 | - | - | 2 | 1 | - | 2 | - | - | - | 2 | - |
| 19A26BT .4 | 2 | 2 | - | - | - | 2 | 2 | - | 2 | - | - | - | 2 | - |
| 19A26BT .5 | 1 | 2 | - | - | - | 1 | 1 | - | 1 | - | - | - | 1 | 1 |

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Title of the Course : Utilization of Electrical Energy
Category : PE
Course Code : 19A26CT
Year : III B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objective:

The objective of this course is to train students on characteristics of various drives, Heating, Welding methodologies, Illumination methods and traction system.

Unit 1 Electric Drives: 09

Advantages of electrical drives – Selection of electrical drive – Classification of drives – Motor power rating for variable loads - Temperature rise – Particular applications of electric drives - Types of industrial loads: Continuous, Intermittent and Variable loads - Load equalization – Energy conservation in drives.

Unit 2 Electric Heating & Welding: 12

Heating: Advantages of electric heating - Resistance heating – Properties and materials of good heating element - Design of heating element - Induction heating and Dielectric heating - Solved problems.

Electric welding - Resistance and Arc welding - Electric welding equipment - Comparison between A.C. and D.C. Welding.

Unit 3 Illumination: 10

Introduction - terms used in illumination - Laws of Illumination - Sources of light – Construction and working of Incandescent Lamp, Fluorescent Tube, Sodium vapour and Mercury vapour lamps – Comparison of different light sources.

Properties of good lighting – Factors affecting the design of good lighting scheme - Street lighting and Flood lighting - Solved problems.

Unit 4 Electric Traction: 14

Track electrification – Types of services - Speed-time curves for different services Trapezoidal and Quadrilateral speed time curves - Mechanics of train movement -Solved problems.

Calculations of Tractive effort, Power and Specific energy consumption for given run, Effect of varying acceleration and braking retardation - Adhesive weight and Coefficient of adhesion – Suitability of motors for traction - Solved problems.

Unit 5 Electric Vehicles: 08

Introduction to EVs -Differences between IC engine vehicles and Electric vehicles -Working of EVs-Electrical Machines for EVs-Types of vehicle chargers-Benefits of electric vehicles.
HEV Fundamentals-Advantages and Disadvantages-HEV Configurations-Power flow control in Series, Parallel and Series-Parallel HEVs.

Prescribed Text Books:

1. B.R. Gupta. Generation of Electrical Energy. Eurasia publishing House (P) Ltd ,New Delhi. 2010.
2. C.L. Wadhwa. Generation, Distribution utilization of Electrical Energy. New Age InternationalPvt .Ltd. 2011.
3. R.K. Rajput. Utilization of Electrical Power. Laxmi Publications (P) Ltd, New Delhi. 2006.
4. Chris Mi, M. Abdul Masrur. Hybrid Electric Vehicles. 2nd Ed, Wiley Publications, 2017.

Reference Books:

1. E. Openshaw Taylor. Utilisation of Electric Energy. Orient Longman, 2009.
2. N.V. Suryanarayana. Utilization of Electrical Power including Electric drives and Electric traction. New Age International (P) Limited Publishers. 1996.
3. Soni, Gupta, Bhatnagar, "Principle of Electrical Engineering", Dhanpatrai& Sons, 2008.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Understand the selection of drives for industrial application | L2 |
| 2. Identify the suitable heating and welding methods for industrial applications | L2 |
| 3. Apply the Illumination phenomena & various Lighting schemes | L3 |
| 4. To impart the knowledge of Electric Traction | L1 |
| 5. Understand the various configurations and power flow control in HEVs | L2 |

COs-POs-PSOs Mapping :

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A26CT .1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 19A26CT .2 | 2 | 2 | - | - | - | 2 | 2 | - | - | - | - | - | 2 | - |
| 19A26CT .3 | 2 | 2 | 2 | - | - | 2 | 2 | - | 2 | - | - | - | 2 | - |
| 19A26CT .4 | 2 | 2 | - | - | - | 2 | 2 | - | 2 | - | - | - | 2 | - |
| 19A26CT .5 | 1 | 1 | - | - | - | 1 | 1 | - | 1 | - | - | - | 1 | 1 |

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| | |
|---|---|
| Title of the Course | Instrumentation |
| Category | PE |
| Course Code | 19A26DT |
| Year | III B.Tech |
| Semester | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objective:

- To study about methods of data transmission and data acquisition system
- To provide basic knowledge about transducers and their working principles
- To study about measurement of non-electrical quantities such as displacement, velocity, acceleration, force, torque etc.
- Describe the architecture details of PLC, SCADA and DCS.

Unit 1 Data Transmission And Telemetry: 10

Methods of Data Transmission – General Telemetry System – Land line Telemetry System – Voltage, Current and position. Land line with feedback system. Frequency Modulation System (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM.

Unit 2 Data Acquisition System (Das) and Signal Analyzers: 10

Analog and Digital Acquisition systems – Components of Analog DAS – Types of Multiplexing Systems: Time division and Frequency division multiplexing – Digital DAS – Block Diagram – Use of Recorders in Digital DAS – Complete data logging System - Block diagram and its working – Modern Digital DAS (Block Diagram),Wave Analyzers, spectrum analyzers.

Unit 3 Transducers: 9

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistive, inductive and capacitor transducers, LVDT Principle; Strain gauge and its principle of operation, gauge factor, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

Unit 4 Measurement of Non-Electrical Quantities: 8

Measurement of strain, Displacement, Velocity, Angular Velocity (DC Tachometer generator, Photoelectric tachometer), acceleration (LVDT), Force (Strainguage, load cells and LVDT), Torque (Magneto-Strictive), Temperature (Thermocouples and Thermistor), Pressure (Resitive,Inductive, LVDT and capacitive),Flow(electromagnetic flow meter, hot wire anemometer), Liquid level (ultrasonic level gauging, resistive and inductive methods).

Unit 5 Real Time Systems: 8

PLC’s: Programmable logic controllers- Organisation- Hardware details- I/O- Power supply- CPU- Standards.

SACADA: Introduction, SCADA Architecture, Different Communication Protocols, Common System Components, Supervision and Control.
DCS: Introduction, DCS Architecture, Local Control (LCU) architecture, Configuration of DCS, displays, redundancy concept.

Text Books:

1. D.V.S Murthy, *Transducers and Instrumentation.* Prentice Hall of India.
2. A.K. Sawhney, *A course in Electrical and Electronic Measurements and Instrumentation*. DhanpatRai& Co.
3. R.G. Jamkar, *Industrial Automation using PLC, SCADA& DCS*, Global education Ltd.

Reference Books:

1. D O Doeblin, *Measurements Systems, Applications and Design*. McGraw Hill Edition.
2. A.S Morris, *Principles of Measurement and Instrumentation*. Pearson /Prentice Hall of India.
3. H.S.Kalsi, *Electronic Instrumentation*. Tata McGraw-Hill Edition, 3/e.
4. A.D Helfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement techniques*. Pearson/Prentice Hall of India.
5. T. R. Padmanabhan, *Industrial Instrumentation – Principles and Design*. Springer.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Understand basic principles involved in the meters for measuring voltage, current, resistance, frequency and so on. | L2 |
| 2. Understand principles of data transmission system and data acquisition system | L2 |
| 3. Get complete knowledge regarding working of advanced instruments such as logic analyzers and spectrum analyzers. | L3 |
| 4. understand the principles of transducers and signal conditioning circuits used in Process control industry, manufacturing industry and Automation plants | L2 |
| 5. Get complete knowledge regarding working of non electrical Quantities | L3 |

COs-POs-PSOs Mapping

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A26DT.1 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 |
| 19A26DT.2 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 3 | - | - | 3 | 3 | 3 |
| 19A26DT.3 | 3 | 3 | 3 | 3 | 3 | 3 | - | 3 | 3 | - | - | 2 | 3 | 3 |
| 19A26DT.4 | 2 | 2 | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | - | 2 | 3 | 3 |
| 19A26DT.5 | 1 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 1 | - | 1 | 3 | 3 |

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| | | |
|---|---|---|
| Title of the Course | : | Fundamentals of HVDC & FACTS Devices |
| Category | : | PE |
| Course Code | : | 19A26ET |
| Year | : | III B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- Study various aspects of HVDC transmission system
- Analyze HVDC converter operation & Elimination of harmonics by filters
- Emphasize the impact of FACTS devices on transient stability and power oscillation damping

Unit 1 Introduction 8

Comparison of AC and DC Transmission systems, Applications of D.C. Transmission, Types of DC links, Typical layout of a HVDC converter station. HVDC converters, Analyses of 3-phase Bridge circuit with and without overlap.

Unit 2 Converter And HVDC System Control 6

Principle of DC link control, Converter control characteristics, System control Hierarchy, Firing angle control, Current and Extinction Angle control.

Harmonics, Filters And Sources Of Reactive Power 4

Introduction of Harmonics, Generation of Harmonics, AC and DC Filters, Sources of Reactive power.

Unit 3 Power Flow Analysis In Ac/Dc Systems 5

Modeling of DC/AC converters, Converter controller equations, Solutions of AC/DC load flow-Simultaneous approach and Sequential approach

FACTS CONCEPTS 5

Flow of power in AC parallel paths and meshed systems, Basic types of FACTS controllers, Brief description and Definitions of FACTS controllers

Unit 4 Static Shunt & Series Compensators 10

Objectives of shunt compensation, Methods of controllable VAR generation,

Static VAR compensators, SVC and STATCOM comparison.

Objectives of series compensation, Variable impedance type- Thyristor Switched Series Capacitors (TSSC), and Switching Converter type Series Compensators – Static Series Synchronous

Compensator (SSSC)

Unit V Static Shunt & Series Compensators 8

Unified power flow controller (UPFC), Basic operating principle, Independent real and reactive power flow controller (IPFC)

Prescribed Text Books:

1. K.R. Padiyar. HVDC power Transmission systems. Wiley Eastern Limited.
2. N.G. Hingorani& L. Gyugyi, Understanding of FACTS IEEE Press.
3. Young Huasong&Alian T. hons. Flexible AC Transmission Systems (FACTS). The Institution of Electrical Engineers, IEE Power and Energy Series 30.
4. AbhijitChakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems, Eastern Economy Edition.

Reference Text books:

1. S. Rao, EHV - AC, HVDC Transmission & Distribution Engineering, Khanna publishers.
2. E Acha. VG Agelidis& O Anaya-Lara. The Miller, Power Electronic Control in Electrical Systems, Elsevier.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Analyze the Economical & Technical aspects of AC & DC Transmission | L1 |
| 2. Analyze the Converter control & Harmonics elimination | L2 |
| 3. Analyze the Power flow analysis in AC/DC & Basic types of FACTS controllers | L3 |
| 4. Emphasize the objectives of static shunt & series compensators | L2 |

CO-PO-PSO Mapping:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A26ET.1 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| 19A26ET.2 | 2 | 3 | - | 3 | - | - | - | - | - | - | - | - | 1 | - |
| 19A26ET.3 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 1 |
| 19A26ET.4 | 3 | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 |

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Title of the Course :Advanced Power Electronic Converters
Category :PE
Course Code :19A26FT
Year :III B.Tech
Semester :II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objective:

- Introduce the various PWM inverters, resonant pulse inverters and multilevel inverters with their operations and applications along with DC and AC power supplies.

Unit 1 PWM Inverters 10

Principle of Operation – Performance Parameters – Single Phase Bridge Inverter – Output Voltage and Current With R, R-L & R-L-C Loads – Voltage Control of Single Phase Inverters – Advanced Modulation Techniques for Improved Performance –Numerical Problems.

Three Phase Inverters –180 Degree Condition –120 Degree Conduction – Analysis – Output Voltage and Current With R, R-L & R-L-C Loads – Voltage Control of Three Phase Inverters – Comparison of PWM Techniques – Harmonic Reductions – Current Source Inverter – Applications – Numerical Problems.

Unit 2 Resonant Pulse Inverters 9

Series Resonant Inverters – Analysis with Unidirectional Switches & Bidirectional Switches – Evaluation of Currents and Voltages – Frequency Response of Series Resonant Inverters – Series Loaded Inverter –Parallel Loaded Inverter –Series and Parallel Loaded Inverters – Parallel Resonant Inverters – Voltage Control of Resonant Inverters – Class E Resonant Inverter & Class E Resonant Rectifier – Numerical Problems- Resonant Converters – Zero Current Switching Resonant Converters – L Type– M Type – Zero Voltage Switching Resonant Converters – Comparison Between ZCS And ZVS – Resonant Converters – Two Quadrant ZVS Resonant Converters– Numerical Problems.

Unit 3 Multilevel Inverters 9

Multilevel Concept – Types of Multilevel Inverters – Diode Clamped Multilevel Inverter – Improved Diode Clamped Inverter – Flying Capacitors Multilevel Inverter – Cascaded Multilevel Inverter–Principle Of Operation – Main Features– Applications – Reactive Power Compensation, Back to Back Intertie System, Adjustable Drives– Switching Device Currents – DC Link Capacitor Voltage Balancing – Features of Multilevel Inverters –Comparisons of Multilevel Converters – Numerical Problems.

Unit 4 DC Power supplies 8

DC Power Supplies – Types – Switched Mode DC Power Supplies– Fly Back Converter – Forward Converter – Push Pull Converter – Half Bridge Converter – Full Bridge Converter –

Resonant DC Power Supplies – Bidirectional Power Supplies – Applications –Numerical Problems.

Unit 5 AC Power supplies 9

AC Power Supplies – Types – Switched Mode AC Power Supplies –Resonant AC Power Supplies –Bidirectional Ac Power Supplies – Multistage Conversions – Control Circuits – Power Line Disturbances – Power Conditioners – Uninterruptible Power Supplies –Applications – Numerical Problems.

Text books:

1. Power Electronics – Mohammed H. Rashid – Pearson Education – Third Edition.
2. Power Electronics – Ned Mohan, Tore M. Undeland and William P. Robbins – John Wileyand Sons – Second Edition.

Reference books**:**

1. B. K Bose, Modern Power Electronics and AC Drives, Pearson Education (Asia)., 2007.
2. P.C. Sen,Power Electronics, Tata McGraw-Hill Publishing Company, 2009.
3. MD. Singh & K. B. Kanchandhani. *Power Electronics*, Tata McGraw Hill Publishing Company, 2nd edition, 2006.

| **Course Outcome** At the end of the course the student will be able to | **Bloom's Level** |
|---|---|
| 1. Acquire knowledge about analysis and design of voltage and current source inverters with PWM techniques. | L1 |
| 2. Acquire knowledge about analysis and design of series and parallel resonant pulse inverters. | L3 |
| 3. Acquire knowledge about analysis and design of multilevel inverters. | L3 |
| 4. Analyze the DC power supplies. | L4 |
| 5. Analyze the AC power supplies. | L4 |

**COs-POs-PSOs Mapping Table**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A26FT.1 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 1 | - |
| 19A26FT 2 | | 3 | - | 2 | 2 | - | - | - | - | - | - | - | | |
| 19A26FT 3 | 3 | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 1 | |
| 19A26FT 4 | 3 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| 19A26FT 5 | 3 | - | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - |

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Title of the course : Power System Simulation Lab
Category : PC
Course Code : 19A264L
Year : III B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | 2 | 1 |

Any Ten of the following experiments are to be conducted

1. Performance of Short/Medium Transmission Lines using MATLAB
2. Computation of parameters and modeling of Long Transmission Lines using MATLAB
3. Determination of GMD and GMR of a Transmission Line using MATLAB
4. Formation of Admittance matrix using Direct Inspection method in MATLAB
5. Formation of Impedance matrix using Zbus Building Algorithm in MATLAB
6. Gauss Siedal method of Load Flow Analysis using MATLAB
7. Newton Raphson method of Load Flow Analysis using MATLAB
8. Decouple method of Load Flow Analysis using MATLAB
9. Short Circuit Analysis for LG and LL faults using MATLAB
10. Short Circuit Analysis for DLG and symmetrical faults using MATLAB
11. Transient Stability Analysis of SMIB system using Equal Area Criteria in MATLAB
12. Transient Stability Analysis of SMIB system using Swing equation in MATLAB
13. Simulation of Ferranti Effect using MATLAB
14. MATLAB Program to find the optimum loading of generators neglecting transmission losses
15. MATLAB Program to find the optimum loading of generators with penalty factor

| Course outcomes: At the end of the course the student will be able to | | Blooms Level |
|---|---|---|
| 1. | Analyze the efficiency, regulation and stability of transmission system | L3 |
| 2. | Understands the formation of Admittance and Impedance matrices | L1 |
| 3. | Analyze Load Flow analysis of transmission systems | L3 |
| 4. | Evaluate Symmetrical and unsymmetrical faults | L4 |
| 5. | Estimate optimum loading of generators and study of Ferranti effect | L1 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A264L .1 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 |
| 19A264L .2 | 2 | 2 | - | - | 2 | - | - | - | - | - | - | - | 2 | - |
| 19A264L .3 | 1 | 1 | - | 1 | 1 | - | - | - | - | - | - | - | 1 | 1 |
| 19A264L .4 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 |
| 19A264L .5 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 |

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| | | |
|---|---|---|
| Title of the Course | : | Power Electronics & Simulation Lab |
| Category | : | PC |
| Course Code | : | 19A265L |
| Year | : | III B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | 3 | 1.5 |

Course Objectives:

- Study the characteristics of power electronic devices with gate firing circuits & forced commutation techniques
- Analyze the operation of Single-phase converters, AC voltage controller and Inverters
- Simulate the various power electronics converters

List of Experiments

1. Gate Firing Circuits for SCR's (R, RC Triggering, UJT firing circuit).
2. Forced Commutation Circuits (Class A, Class B).
3. Single Phase Half Controlled Bridge Converter with R and RL loads.
4. Single Phase Fully Controlled Bridge Converter with R and RL loads. .
5. DC Jones Chopper with R and RL Loads.
6. Single Phase Series Inverter with R and RL loads.
7. Single Phase Parallel Inverter with R and RL loads.
8. Single Phase AC Voltage Controller with R and RL Loads.
9. Single Phase Cyclo Converter with R and RL loads.
10. Single Phase Dual Converter with RL load.
11. Simulation of Single-Phase Fully Controlled Rectifier with R, RL & RLE loads.
12. Simulation of Single Phase Full Bridge Inverter with PWM control.
13. Simulation of Single-Phase Full Wave AC voltage controller with R&RL loads.

Virtual Lab:

14. Single Phase Half Wave Uncontrolled Rectifier for R and L load

Course Outcomes:

| Student will be able to | Blooms Level |
|---|---|
| 1. Analyze various characteristics of semi conductor devices with their firing circuits and commutation methods | L1 |
| 2. Design and implement AC to DC converters with different loads | L2 |
| 3. Analyze and understand the characteristics on DC to DC converters | L2 |
| 4. Verify the performance of DC to AC & AC to AC converters with different loads | L3 |
| 5. Analyze and design simulation of converter circuits with different loads | L3 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A265L.1 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | - |
| 19A265L.2 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 3 | 2 |
| 19A265L.3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 3 | - |
| 19A265L.4 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 2 | 3 | 2 |
| 19A265L.5 | 2 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | 3 | - |

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| | |
|---|---|
| Title of the Course | General Aptitude |
| Category | HS |
| Course Code | 19AC61L |
| Year | III B. Tech |
| Semester | I Semester |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | - | 1 |

Course Objectives:

- To equip students with aptitude and reasoning skills in order to help them succeed in competitive exams.
- To help students improve their knowledge of quantitative and reasoning skills, which in turn helps them comprehend and solve various mathematical problems in professional life.
- To equip students with English verbal and reasoning skills in order to help them succeed in exams like GRE, TOEFL and help them to do well in placement drives.
- To help students improve their knowledge of grammar, vocabulary and reasoning skills pertain to English.

Quantitative Aptitude:
Number Systems - HCF and LCM - Averages - Problems on ages– Percentages - Profit and loss - Simplification - Ratio and Proportion - Time and Work - Time and Distance - Simple interest and Compound interest –Calendar - Clocks – Mensuration: Area, Volume and Surface Areas - Data Interpretation: Tabulation, Line Graphs, Bar Graphs, Pie charts.

Reasoning:
Directions - Blood Relations - Series and Sequences - Odd man out - Coding and Decoding - Data Sufficiency-Logical deductions.

English for Competitive Examinations
Synonyms – Antonyms – Analogy – Words often confused, One-word substitutions – Idioms and Phrases – Homonyms – Spellings
Reading comprehension – Cloze tests
Articles – Prepositions – Tenses – Voice – Error spotting and correcting – Sentence improvement.
Rearrangement of jumbled words and jumbled sentences – word pairs – sentence completion

Prescribed Textbooks:

1. R.S. Agarwal, Quantitative Aptitude, S. Chand Publishers, New Delhi, 2005.
2. R. S. Agarwal, Verbal and Non-Verbal Reasoning, S. Chand Publishers, New Delhi, 1998.

3. Hari Prasad, “Objective English for Competitive Exams”, TMH
4. R. S. Agarwal, “Objective English”, S. Chand Publishers

Reference Books

1. Shakuntala Devi, Puzzles to Puzzle you, Orient Paper Backs Publishers (OPB), New Delhi, 2005.
2. Arun Sharma, How to Prepare for Quantitative Aptitude, TMH Publishers, New Delhi, 2003.
3. Sharon Weiner-Green, IrnK.Wolf, Barron’s GRE, Galgotia Publications, New Delhi, 2006.
4. Shakuntala Devi, More Puzzles, OPB, New Delhi, 2006.
5. Ravi Narula, Brain Teasers, Jaico Publishing House, New Delhi, 2005.
6. George J Summers, Puzzles and Teasers, Jaico Publishing House, Mumbai, 2005

Course Outcomes:

Student will be able to

1. demonstrate various principles involved in solving mathematical problems pertain to Quantitative functions.
2. decode information from charts and interpret their logical thinking in the aspects.
3. interrelate English vocabulary with the knowledge of synonyms, antonyms, idiomatic expressions and, accuracy in English spelling
4. apply knowledge of articles, prepositions, tenses and voice to correct errors or to improve sentences

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19AC61L.1 | 3 | | | | | | | | | | | 3 |
| 19AC61L.2 | 3 | | | | | | | | | | | 3 |
| 19AC61L.3 | | | | | | | | | | 3 | | 3 |
| 19AC61L.4 | | | | | | | | | | 3 | | 3 |

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| | |
|---|---|
| Title of the Course | Universal Human Values - II |
| Category | HS |
| Course Code | 19AC63T |
| Year | III B.Tech |
| Semester | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 1 | 1 | - | 2 |

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection
- Development of commitment and courage to act

Unit 1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education 6

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and
- Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for
- fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innateacceptance for living with responsibility (living in relationship, harmony and co-existence)rather than as arbitrariness in choice based on liking-disliking.

Unit 2 Understanding Harmony in the Human Being - Harmony in Myself! 6

- Understanding human being as a co-existence of the sentient 'I' and the material'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct

- appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

| | | |
|---|---|---|
| Unit 3 | Understanding Harmony in the Family and Society- Harmony in Human- Human<br><br>Relationship | 6 |

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

| | | |
|---|---|---|
| Unit 4 | Understanding Harmony in the Nature and Existence -Whole existence as Coexistence | 6 |

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability
- and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

| | | |
|---|---|---|
| Unit 5 | Implications of the above Holistic Understanding of Harmony on Professional Ethics | 6 |

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Prescribed Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course inHuman Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi,2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

Course Outcomes:

| | Blooms Level of Learning |
|---|---|
| • Students are expected to become more aware of themselves, and their surroundings (family, society, nature) | L2 |
| • They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. | L2 |
| • They would have better critical ability. | L2 |
| • They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). | L2 |
| • It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19AC63T.1 | | | | | | | | | | | | 3 |
| 19AC63T.2 | | | | | | | | | | | | 3 |
| 19AC63T.3 | | | | | | | | | | | | 3 |
| 19AC63T.4 | | | | | | | | | | | | 3 |
| 19AC63T.5 | | | | | | | | | | | | 3 |

**Assessment pattern for UHV-2**

Assessment Pattern for Universal Human Values-II courses assessment is described hereunder.

UHV-2 course carries two credits. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.

A student has to secure 40% marks out of 100 in the CIE and SEE together to qualify for the award of the degree. The distribution shall be 50 marks for continuous internal assessment and 50 marks for semester end examination.

Internal evaluation shall be conducted for the course during semester and shall be evaluated for 50 marks and distributions of marks as follows:

- Assessment by faculty mentor: 10 marks
- Self-assessment: 10 marks
- Assessment by peers: 10 marks
- Socially relevant project/Group Activities/Assignments: 20 marks

Semester End examination is done for 50 marks and is of 2 hours duration. The question paper shall be of subjective type with 5 questions, one question from each unit, with internal choice. All the questions carry equal marks of 10 each.

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| | | |
|---|---|---|
| Title of the Course | : | Distribution of Electrical Power |
| Category | : | PC |
| Course Code | : | 19A271T |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To learn the basics of Distribution system, different types of loads and their characteristics and to understand the Design considerations.
- To understand the concepts of DC & AC distribution of power in terms of load voltage drop and power loss,
- To know the fundamental components of Substation and bus bar arrangements.
- To understand the need of Power Factor and Voltage Control in Distribution systems.
- To understand the concept of Distribution System Planning and different planning techniques

Unit 1 General concepts &Design: 8

Considerations of Distribution Feeders: Introduction, Various Factors in Distribution Systems (Coincidence factor, Contribution factor and Loss factor). Relationship between Load factor and Loss factor, Classification of loads and their characteristics.

Design Considerations of Distribution Feeders: Radial and Ring or loop & Inter connected distributed systems and its advantages and disadvantages, Secondary Distribution System.

Unit 2 Voltage Drop Calculations in DC & A.C. distribution systems: 10

DC Distribution Systems: Voltage Drop Calculationsfor the following cases: DC Distributor fed at one end and both ends with equal and unequal voltages for both concentrated and uniform loading, Numerical Problems.

A.C. Distribution Systems: Voltage Drop Calculationsfor the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages, Numerical Problems.

Unit 3 Substations and bus bar arrangements: 8

Introduction, Factors to be consider for Site selection, Classification of substations, Merits and demerits of Indoor and Outdoor Substation-Substation equipment.Bus bar arrangements in Sub-Stations: Single bus bar system, Single bus bar with sectionalization, Double bus bar with one circuit breaker, Double bus bar with two circuit breakers, Breaker and a half with two main buses, Main and transfer bus bar, Double bus bar with bypass isolator and Ring bus with relevant diagrams

Unit 4 Power factor and voltage control: 8

Power factor Control - Definition, causes of low power factor and its Effects, Advantages of improving power factor -Methods of Improving power factor– Static shunt and series capacitors, Synchronous Condensers, Phase advancers.
Voltage Control - Introduction, Necessity of Voltage Control, Methods of Voltage Control: Excitation control, Shunt Capacitors and reactors, Series Capacitors, Tap changing and Booster Transformers, Synchronous Condensers.

Unit 5 Distribution system planning: 6
Distribution System Planning- Factors Affecting System Planning-Load forecasting-classification of Load forecasting-substation expansion, Distribution System Planning Models, Present Distribution System Planning Techniques.

Prescribed Text Books:

1. TuranGonen. Electric Power Distribution System Engineering. McGraw-Hill Book Company, 1986.
2. A.S.Pabla, Electric Power Distribution. 4th edition, Tata McGraw-Hill Publishing Company, 1997.
3. James Northcoto Green, Robert Wilson, "Control and Automation of Electrical Power Distribution Systems" CRC Press, Taylor and Francis.

Reference Books:

1. V.Kamaraju. Electrical Power Distribution Systems. Right Publishers, 2001.
2. S. Sivanagaraju, Electrical Power Distribution & Automation, Educational & Technical Publishers.
3. Dr. M. K. Khedkar and Dr. G. M. Dhole, Electric Power Distribution Automation University Science Press.

| | Course outcomes: At the end of the course the student will be able to | Blooms level |
|---|---|---|
| CO 1 | Understand the distribution systems performance for various load models. | L 2 |
| CO 2 | Solve the voltage drop and power loss of distributor | L 3 |
| CO 3 | Explore the importance of substations and analyze the arrangement of bus bars. | L 2 |
| CO 4 | Recognize the necessity of power factor improvement and voltage control in distribution system. | L 2 |
| CO 5 | Demonstrate the concept of Distribution System Planning and its techniques. | L 2 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A271T.1 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 19A271T.2 | 2 | 2 | - | - | 2 | - | - | - | - | - | - | - | 2 | - |
| 19A271T.3 | 1 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | 1 | - |
| 19A271T.4 | 1 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 1 |
| 19A271T.5 | 1 | 1 | 1 | - | 1 | - | - | - | - | - | - | - | 1 | - |

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Title of the Course : Power Semiconductor Drives
Category : PC
Course Code : 19A272T
Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 2 | - | - | 2 |

Course Objectives:

- Study control of DC motor drives with single phase and three phase converters
- Analyze DC-DC converter operation
- Study control of AC motor drives with variable frequency and voltage characteristics

Unit 1 Introduction 10

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed DC motors.

Three phase semi and fully controlled converters connected to DC separately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

Unit 2 Four quadrant operations of DC drives 8

Introduction to Four quadrant operation – Motoring operations,
Electric Braking – Plugging, Dynamic and Regenerative Braking operations.
Four quadrant operation of D.C motors by dual converters – Closed loop operation of DC motor (Block Diagram Only)

Unit 3 Control of dc motors by choppers 8

Single quadrant, Two –quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed torque expressions – speed torque characteristics – Problems on Chopper fed d.c Motors – Closed Loop operation ( Block Diagram Only)

Unit 4 Control of Induction Motor From Stator 10

Variable voltage characteristics: Control of Induction Motor by AC Voltage Controllers – Waveforms – speed torque characteristics.

Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converter- PWM control – Comparison of VSI, CSI operations –
Speed torque characteristics – Numerical problems on induction motor drives –

Closed loop operation of induction motor drives (Block Diagram Only).

Unit 5 Control of Induction Motor From Rotor 10

Static rotor resistance control – Slip power recovery – Static Scherbius drive –
Static Kramer Drive – their performance and speed torque characteristics – advantages - applications – problems
Separate control &Self control of synchronous motors –Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems

Prescribed Text Books:

1. G K Dubey, Fundamentals of Electric Drives. Narosa Publications,2nd Edition.
2. M.H.Rashid, Power Electronic Circuits, Devices and applications, PHI, 4th Edition.

Reference books:

1. MD Singh and K B Khanchandani, Power Electronics.Tata McGraw-Hill Publishing Company.
2. B.K.Bose, Modern Power Electronics and AC Drives. PHI.
3. VedamSubramanyam,Thyristor Control of Electric Drives. Tata McGraw Hill Publications.

| Course outcomes: At the end of the course the student will be able to | Blooms Level |
|---|---|
| 1. Analyze the control of DC motors by Single phase & Three phase line commutated converters | L2 |
| 2. Analyze the Four quadrant operation of DC drives | L2 |
| 3. Analyze the control of DC motors by choppers | L2 |
| 4. Analyze the control of AC motors by single phase AC voltage controllers | L3 |
| 5. Analyze the control of AC motors by Inverters | L3 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A272T.1 | 3 | 2 | 3 | - | - | - | - | - | 3 | 3 | 2 | - | 2 | 3 |
| 19A272T.2 | 2 | 2 | 2 | - | - | - | - | - | 2 | 2 | 2 | - | 3 | 2 |
| 19A272T.3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 3 | 3 | - | 3 | 2 |
| 19A272T.4 | 2 | 3 | 3 | - | - | - | - | - | 3 | 2 | 3 | - | 2 | 3 |
| 19A272T.5 | 3 | 2 | 3 | - | - | - | - | - | 2 | 3 | 3 | - | 3 | 3 |

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Title of the Course : Special Electrical Machines
Category : PE
Course Code : 19A27AT
Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- Study of the principle of operation of special machines which are used in several home appliances and electronic gadgets.

Unit 1 Synchronous Reluctance Motors 10
Constructional features of Synchronous Reluctance motor - Types - Axial and radial air gap motors - Operating principle - Reluctance - Phasor diagram – Characteristics - Vernier motor.

Unit 2 Switched Reluctance Motors 10
Constructional features of Switched Reluctance motor - Principle of operation - Torque prediction - Power controllers - Non-linear analysis - Microprocessor based control - Characteristics - Computer control.

Unit 3 Stepper Motors 10
Constructional features - Principle of operation -Variable reluctance motor - Hybrid motor - Single and multi stack configurations - Theory of torque predictions - Linear and non-linear analysis - Characteristics - Drive circuits.

Unit 4 Permanent Magnet BLDC Motors (PMBLDC) 10
Principle of operation of PMBLDC - Types - Magnetic circuit analysis - EMF and torque equations - Power controllers - Motor characteristics and control.

Unit 5 Permanent Magnet Synchronous Motors (PMSM) 10
Principle of operation of PMSM - EMF and torque equations - Reactance - Phasor diagram - Power controllers - Converter - Volt-ampere requirements - Torque speed characteristics - Microprocessor based control.

Prescribed Text Books:

1. T.J.E. Miller. Brushless Permanent Magnet and Reluctance Motor Drives. Clarendon Press, Oxford, 1989.
2. P.P. Aearnley. Stepping Motors – A Guide to Motor Theory and Practice. Peter Perengrinus. London, 2002.

REFERENCE BOOKS:

1.M.G.Say&E.O.Taylor, DC Machines, 2nd Edition, EBLS.
2.T. Kenjo. Stepping Motors and Their Microprocessor Controls. Clarendon Press London, 1990.
3.T. Kenjo and S. Nagamori, Permanent Magnet and Brushless DC Motors, Clarendon Press, London, 1990.

| Course Outcomes: At the end of the course the student will be able to | Blooms Level |
|---|---|
| 1. Describe the construction and operation of Synchronous Reluctance motors | L1 |
| 2. Describe the construction and operation of Switched Reluctance motors. | L1 |
| 3. Describe the construction and operation of Stepper motors. | L1 |
| 4. Describe the construction and operation of PMBLDC motors. | L1 |
| 5. Describe the construction and operation of PMSM motors. | L1 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27AT.1 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 |
| 19A27AT.2 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 |
| 19A27AT.3 | 3 | 3 | - | - | - | 3 | - | - | 3 | - | - | 3 | 3 | 2 |
| 19A27AT.4 | 3 | 3 | - | - | - | 3 | - | - | - | - | - | 3 | 3 | - |
| 19A27AT.5 | 3 | 3 | - | - | - | 3 | - | - | - | - | - | 3 | 3 | - |

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| | | |
|---|---|---|
| Title of the Course | : | Smart Grid |
| Category | : | PE |
| Course Code | : | 19A27BT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To Understand the challenging issues and architecture of smart grid
- To understand the structure and functional units of a smart grid.
- To learn the communication technologies in smart grid.
- To understand the impacts and the various issues associated with integration of renewable resources to the Grid.

Unit 1 Smart Grid Architectural Designs: 9

Introduction – Comparison of Power grid with Smart grid –Challenges in power grid
Advantages of building integrated and distributed power systems-Smart grid components and their limitations-Grid vision based on intelligent architecture-Wholesale energy market in smart grid-smart vehicles in smart Grid.

Unit 2 Communications And Measurements 10

Latest wired and wireless technologies-Characteristics of smart grid communications technology and communication techniques-Switching techniques and communication channels-. Wide area monitoring systems-Phasor measurement units-Key components of smart metering-Communication infrastructure and protocols for smart metering-Advanced metering infrastructure Multi agent systems for smart grid implementation

Unit 3 Performance Analysis Tools 9

Load flow studies for smart grid-Extended formulations and algorithms-Security assessment -Contingency studies -Voltage stability -Energy management in smart grids

Unit 4 Distribution Management System: 9

SCADA-Customer Information System-Modeling and analysis Tool: Topology analysis-load forecasting-power flow analysis-fault calculation-state estimation Applications: system monitoring and operation-outage management system-Islanding and smart grid protection and security.

Unit 5 Renewable Energy and Storage: 9

Renewable Energy Resources-Sustainable Energy Options for the Smart Grid-Penetration and Variability Issues Associated with Sustainable Energy Technology

Prescribed Text Books:

1. E.W. Golding and F.C. Widdis Electrical Measurements and measuring Instruments, 5th Edition, Reem Publications.
2. A.K.Sawhney, Electrical & Electronic Measurement & Instruments, DhanpatRai& Co. Publications.

Reference Books:

1. R. K.Rajput Electrical & Electronic Measurement & Instrumentation., 2nd Edition, S. Chand & Co.
2. H. S. Kalsi Electronic Instrumentation .Tata Graw Hill Mc, 3rd Edition.
3. Buckingham and Price Electrical Measurements, Prentice –Hall
4. Reissland, M.U Electrical Measurements: Fundamentals, Concepts, Applications-New Age International (P) Limited, Publishers.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Describe basic requirements and the concepts of electrical measuring instruments. | L1 |
| 2. Measure the energy and power through energy meter and wattmeter. | L3 |
| 3. Explain the concept of potentiometers and instrument transformers. L1 | L4 |
| 4. Measure the resistance, inductance, capacitance and frequency. | L5 |
| 5. Explain the principle and operation of CRO and digital meters. | L4 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27BT.1 | 1 | 1 | - | - | - | - | - | - | 3 | - | - | - | 1 | - |
| 19A27BT.2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| 19A27BT.3 | 2 | 2 | 2 | - | - | - | - | - | 3 | - | - | - | 2 | 2 |
| 19A27BT.4 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
| 19A27BT.5 | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - | 1 | 1 |

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| | | |
|---|---|---|
| Title of the Course | : | Principles of Power Quality |
| Category | : | PE |
| Course Code | : | 19A27CT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives: This course will able to

- Power quality terminology, power quality issues, classification
- Different sources of power quality disturbances
- Harmonic distortion; Principles for controlling harmonics
- Power quality measuring equipment; Power quality monitoring standards
- Impact of distributed generation on power quality

Unit1 Introduction To Power Quality 8

Power Quality- definition, terminology, issues, evaluation procedure, responsibilities of the suppliers and users of electric power, power quality standards, CBEMA and ITI curves.

Unit 2 Power Quality Disturbances 10

General classes of power quality problems- Impulsive and oscillatory transients. Long duration voltage variations - over voltage, under voltage, sustained interruption. Short duration voltage variations-interruption, sag, swell and outage. Sources of sags and interruptions, estimating voltage sag performance overview of mitigation methods.

Unit 3 Fundamentals Of Harmonics 10

Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices. Harmonic sources from commercial and industrial loads. Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, and devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

Unit 4 Power Quality Monitoring 9

Power quality benchmarking, monitoring considerations, choosing monitoring locations, permanent power quality monitoring equipment, historical perspective of power quality measuring instruments. Power quality measurement equipment-types of instruments, assessment of power quality measurement data, power quality monitoring standards.

Unit 5 Distributed Generation And Grid Interconnection 8

Distributed generation -connection requirements and impacts on the network. Interaction and optimal location of DG-Eigen analysis and voltage interaction. Power quality in DG-Mitigation of voltage dip during motor start, harmonic effects with DG, voltage flicker and fluctuation. Islanding issues, distribution line compensation-heavy Load and Light load condition, real generation, protection issues for distributed generation, technologies for distributed generation, power quality impact from different DG types.

Prescribed Text Books:

1. Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, 3rd edition, TMH Education Pvt. Ltd., 2012.
2. Arindam Ghosh, Gerard Ledwich, Power quality enhancement using custom power devices, Kluwer academic publishers, 2002

Reference Text books:

1. G.T. Heydt, Electric Power Quality, Stars in a circle Publications, 1991. USA.
2. SurajitChattopadhyaya, MadhuchhandaMitra, SamarjitSenugupta, Electrical Power Quality, Springer Dordrecht Heidelberg London New York.
3. Math H. J. Bollen, Understanding Power quality problems, IEEE Press, 2007.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Demonstrate knowledge on sources of power quality disturbances and issues, power quality monitoring and measuring instruments, power quality standards, effect of distributed generation on power quality. | L1 |
| 2. Analyze various power quality issues. | L3 |
| 3. Design a suitable harmonic filter for commercial and industrial loads. | L4 |
| 4. Investigate various power quality issues and provide feasible solutions for improvement of power quality. | L5 |
| 5. Select and use an appropriate equipment for monitoring and measurement of power quality. | L4 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27CT.1 | 3 | - | - | - | - | - | - | - | - | - | - | - | -3 | - |
| 19A27CT.2 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - |
| 19A27CT.3 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - |
| 19A27CT.4 | 3 | 3 | - | - | 3 | - | - | - | - | - | - | - | - | 3 |
| 19A27CT.5 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | - | - | 3 |

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Title of the Course : Programmable Logic Controllers
Category : PE
Course Code : 19A27DT
Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- It is to provide and ensure a comprehensive understanding of using advanced controllers in measurement and control instrumentation.
- To illustrate about data acquisition – process of collecting information from field instruments.
- To analyze Programmable Logic Controller (PLC), IO Modules and internal features.
- To Comprehend Programming in Ladder Logic, addressing of IO.
- To apply PID and its Tunning.

UNIT 1 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT 2 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT 3 10

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT 4 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT 5 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

Prescribed Text Books:

1. Programmable Logic Controllers – Principle and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI
2. Digital Design by Morris Mano, PHI, 3rd Edition 2006.

Reference books:

1. Programmable logic Controllers, Frank D. Petruzella, 4th Edition, McGraw Hill Publishers.
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth & F.D Hackworth Jr. – Pearson, 2004.
3. Programmable logic controllers and their Engineering Applications, 2nd Edition, Alan J. Crispin.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Describe the main functional units in a PLC and be able to explain how they interact. | L1 |
| 2. know different bus types used in automation industries. | L1 |
| 3. Development of ladder logic programming for simple process. | L2 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27DT.1 | | | | | | | | | | | | | | |
| 19A27DT.2 | | | | | | | | | | | | | | |
| 19A27DT.3 | | | | | | | | | | | | | | |

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Title of the Course : Hybrid Electric Vehicles
Category : PE
Course Code : 19A27ET

Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To study the concepts and drive train configurations of electric drive vehicles
- To provide different electric propulsion systems and energy storage devices
- To explain the technology, design methodologies and control strategy of hybrid electric vehicles
- To emphasize battery charger topologies for plug in hybrid electric vehicles

UNIT 1 Introduction to Electric Vehicles: 10

Sustainable Transportation – EV System – EV Advantages – Vehicle Mechanics – Performance of EVs – Electric Vehicle drivetrain – EV Transmission Configurations and components- Tractive Effort in Normal Driving – Energy Consumption – EV Market – Types of Electric Vehicle in Use Today – Electric Vehicles for the Future.

UNIT 2 Electric Vehicle Modeling 9

Consideration of Rolling Resistance – Transmission Efficiency – Consideration of Vehicle Mass – Tractive Effort – Modeling Vehicle Acceleration – Modeling Electric Vehicle Range - Aerodynamic Considerations – Ideal Gearbox Steady State Model – EV Motor Sizing – General Issues in Design.

UNIT 3 Introduction to electric vehicle batteries 10

electric vehicle battery efficiency – electric vehicle battery capacity – electric vehicle battery charging – electric vehicle battery fast charging – electric vehicle battery discharging – electric vehicle battery performance – testing.

UNIT 4 Hybrid Electric Vehicles 8

HEV Fundamentals -Architectures of HEVs- Interdisciplinary Nature of HEVs – State of the Art of HEVs – Advantages and Disadvantages – Challenges and Key Technology of HEVs – Concept of Hybridization of the Automobile-Plug-in Hybrid Electric Vehicles – Design and Control Principles of Plug-In Hybrid Electric Vehicles – Fuel Cell Hybrid Electric Drive Train Design – HEV Applications for Military Vehicles.

UNIT V Advanced topics 8

Battery Charger Topologies, Charging Power Levels, and Infrastructure for PlugIn Electric and Hybrid Vehicles – The Impact of Plug-in Hybrid Electric Vehicles on Distribution Networks – Sizing Ultra capacitors for Hybrid Electric Vehicles.

TEXT BOOKS:


1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design – MehrdadEhsani, UiminGao and Ali Emadi – Second Edition – CRC Press, 2010.
2. Electric Vehicle Technology Explained – James Larminie, John Lowry – John Wiley & Sons Ltd, – 2003.
3. Electric Vehicle Battery Systems – Sandeep Dhameja – Newnes – New Delhi – 2002.
4. Hybrid electric Vehicles Principles and applications With practical perspectives -Chris Mi, Dearborn – M. AbulMasrur, David WenzhongGao – A John Wiley & Sons, Ltd., – 2011.
5. Electric & Hybrid Vehicles – Design Fundamentals – Iqbal Hussain, Second Edition, CRC Press, 2011.


Course Outcomes: By the end of this course, students will be able to — Blooms Level

1. Understand the concepts and drive train configurations of electric drive vehicles — L1
2. Interpret different electric propulsion systems and energy storage devices — L2
3. Appreciate the technology, design methodologies and control strategy of hybrid electric vehicles — L2
4. Realize battery charger topologies for plug in hybrid electric vehicles — L2

**COs-POs-PSOs Mapping Table**

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27ET.1 | 3 | - | - | - | 2 | | 2 | - | - | - | 2 | 2 | 2 | - |
| 19A27ET.2 | 3 | - | - | - | - | - | 2 | - | - | - | 2 | 2 | 2 | 1 |
| 19A27ET.3 | 3 | - | - | - | - | - | 2 | - | - | - | 2 | 2 | 2 | - |
| 19A27ET.4 | 3 | - | - | - | 2 | - | 2 | - | - | - | 2 | 2 | 2 | - |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET**

(An Autonomous Institution)

| | |
|---|---|
| Title of the Course | Digital Signal Processing |
| Category | PE |
| Course Code | 19A27FT |
| Year | IV B.Tech |
| Semester | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- The course aims to provide the student with the ability
- To understand application of Discrete Fourier series and Transforms
- To learn design techniques and applications of Digital signal processing

Unit 1 Introduction and discrete Fourier series: 10

Discrete time signals, LTI systems, stability and causality, Solution of linear constant coefficient difference equations, frequency domain representation of discrete time signals. Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT

Unit 2 Fast Fourier transforms: 9

Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N, applications of FFT algorithms.

Unit 3 IIR Digital Filters 9

Analog filter approximations-Butterworth and chebyshev, design of digital filters from analog filters. IIR Structures- Direct form –I , Direct form- II, Transposed Structure, Cascade form.

Unit 4 FIR Digital Filters 9

Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique and Fourier method, comparison of IIR and FIR filters

Unit 5 Digital signal processors: 10

Introduction – Architecture – Features – Addressing Formats – Introduction to Commercial DS Processors.APPLICATIONS OF DIGITAL SIGNAL PROCESSING: Spectral analysis of non stationary Signals, Musical Sound processing, signal Compression, Oversampling A/D Converter, Oversampling D/A Converter.

Prescribed Text Books

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata Mcgraw Hill, 3rd edition, 2009.

Reference Books:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.
3. Digital Signal Processing- P.RameshBabu, 4th Ed. Scitech Publications.
4. SenM.kuo, woonseng…s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson,2013

| Course Outcomes: At end of course student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand the types of discrete time signals & systems and analyze using Fourier series and Fourier transforms. | L2 |
| 2. Know the basics of digital filters and design using different techniques. | |
| 3. Gain knowledge on programmability digital signal processor | L1 |
| 4. Know the applications in Real life | L2 |
| | L1 |

COs-POs-PSOs Mapping

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A27FT.1 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 3 | - | 3 | 3 |
| 19A27FT.2 | 1 | 1 | 1 | - | - | - | - | - | 1 | 1 | 1 | - | 3 | 3 |
| 19A27FT.3 | 3 | 3 | - | 3 | - | - | - | - | 3 | 3 | 3 | - | 3 | 3 |
| 19A27FT.4 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 3 | - | 3 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: Basic Civil Engineering
Category : OE
Course Code : 19A17GT
Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives:

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering.
- To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Unit 1 : (8hrs)

Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career.
History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

Unit 2 : (10hrs)

Overview of National Planning for Construction and Infrastructure Development; Position
of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works;
Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.

Unit 3 : (10hrs)

Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction;
Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunnelling.

Unit 4 : (8hrs)

Hydraulics &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi-purpose reservoir projects.
Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;

Unit 5 : (8hrs)

Computational Methods, IT, IoT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building

Information Modelling; Highlighting typical available software systems ( STAAD, ETAB & AUTOCAD)

PrescribedText Books:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
4. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy
5. Building Planning & Drawing by Dr N. Kumaraswamy and A.Kameswara Rao, Charitor Publications
6. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.

Reference Text books:

1. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc.corresponding to materialsused for Civil Engineering applications
2. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill.
4. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering. | L3 |
| 2. Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration. | L1 |
| 3. Highlighting the depth of engagement possible within each of these areas. | L3 |
| 4. Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering. | L3 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A16GT.1 | | | | | | 3 | | | 2 | | | 1 | 1 | 2 | |
| 19A16GT.2 | | | | | | 3 | | | 2 | | | 1 | 1 | 2 | |
| 19A16GT.3 | | | | | | 3 | | | 2 | | | 1 | 1 | 2 | |
| 19A16GT.4 | | | | | | 3 | | | 2 | | | 1 | 1 | 2 | |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: Water Resources and Conservation
Category : OE
Course Code : 19A17HT
Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives:

- To impart knowledge about the planning and management of water resources.
- To introduce the concepts of watershed management, integrated water resources management, environmental interaction of water resources and policies/framework related to water resources.
- To enable the students to understand the different components of water resources and water conservation techniques.

Unit 1 : (8hrs)
Historical profile on world water resources development; Global water resources, Hydrologic cycle, Watershed zoning, Interrelation of water resources with other natural resources and the environment, Water quantity and water budget, Water allocation and water scheduling; Water resources availability and demand.

Unit 2 : (10hrs)
Hydrologic Processes – evaporation, transpiration and precipitation; Water quality parameters, Water pollution – causes, effects and measures; Rainfall-Runoff analysis, Floods measurement, frequency analysis, design of peak flood and routing, Reservoir operation and design.

Unit 3 : (10hrs)
Water resource planning – concept, preliminary study, feasibility study, detailed planning, Design of water distribution system, Irrigation scheduling and techniques;
Water use sectors – Domestic, Industries and Agriculture, Sustainable water resources development, Integrated Water Resources Management (IWRM), Socio-economic aspects of water resources management, Rainwater Harvesting Watershed management.

Unit 4 : (9hrs)
Global Efforts on Water conservation, Think Globally Act Locally on water resources, Local water organizations, National Water Policy, World water organizations - WUGs, WUAs, UN, WWP, WWC, etc. Environmental discourse on dam Construction.

Unit 5 : (8hrs)
Water conservation Techniques: Protection of Water from Pollution, Redistribution of Water, Rational Use of Groundwater, Renovation of Traditional Water Sources, Use of Modern Irrigation Methods, Increasing Forest Cover, Change in Crop Pattern, Flood Management, Conserving Water in Industries, Conservation of water by Municipal authorities, Use rainwater effectively, Make effective use of soil water reserves, Take measures to avoid run off, Avoid wasting water through evaporation, Reduce water losses through drainage, Plan your irrigation, Contour Farming& Contour Ploughing

PrescribedText Books:

1. Global Water Partnership (GWP), Integrated Water Resources Management, Background Papers No. 4, Technical Advisory Committee (TAC)..
2. Water Resources Systems Planning and Management, Vol. 51 by Jain, S.K. and V.P. Singh, Elsevier Science
3. Hierarchical Analyses of Water Resources Systems: Modeling and Optimization of Largescale systems by Haimes, McGraw-Hill, New York.
4. Water Resources Systems Planning and Management by Loucks D.P. and van Beek E., UNESCO Publishing, The Netherlands.

Reference Text books:

1. Water Resources Systems Planning and Analysis by Loucks, D.P., J.R. Stedinger, and D.A. Haith, Prentice-Hall, N.J.
2. Hydrosystems Engineering and Management by Mays, L.W. and K. Tung, McGraw-Hill Inc., New York.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Identify different problems related to water resources planning, management and development. | L3 |
| 2. Describe problems like water balance, rainfall-runoff analysis, water distribution networks, flood routing, irrigation scheduling, water pollution and other water related concerns | L2 |
| 3. Apply principles and guidelines to solve above mentioned problems. | L4 |
| 4. Understand different water conservation techniques, in order to save water for future | L2 |

CO-PO Mapping:

| OE | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A16HT.1 | | | | | | 2 | 3 | | 2 | | | | 1 | | 3 |
| 19A16HT.2 | | | | | | 2 | 3 | | 2 | | | | 1 | | 3 |
| 19A16HT.3 | | | | | | 2 | 3 | | 2 | | | | 1 | | 3 |
| 19A16HT.4 | | | | | | 2 | 3 | | 2 | | | | | | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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| | | |
|---|---|---|
| Title of the Course | : | Introduction to Mechatronics |
| Category | : | OE |
| Course Code | : | 19A37JT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | 0 | 3 |

Course Objectives: This course will

- Familiarize the technologies behind modern mechatronic systems.
- Explain fundamentals for the development of fully automated system.
- Develop a robotic or automated systems focusing on the hardware and software integration.
- Demonstrate the development of mechatronic system and MEMS.

Unit 1 Introduction 09

Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications–Computer numerical control(CNC) machines, Tool monitoring systems, Flexible manufacturing system(FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

Unit 2 : Signal Conditioning 09

Introduction, hardware digital I/O, analog input – ADC resolution, speed channels filtering noise using passive components – resistors, capacitors – amplifying signals using OP amps – software – digital signal processing – low pass, high pass, notch filtering.

Unit 3 Sensors & Actuators 09

Sensors: Static characteristics & sensors, displacement, position and proximity sensors. Force and torque sensors, pressure sensors, flow sensors, temperature sensors, acceleration sensors, level sensors, selection criteria for sensors.

Actuators: Mechanical, electrical, hydraulic & pneumatic actuation systems characteristics and their limitations. Design of hydraulic & pneumatic circuits.

Unit 4 Microprocessors, Micro controllers and Programmable Logic Controllers 09

Architecture of of Microprocessor, Micro controller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

Unit 5 Micro Electro Mechanical Systems(MEMS) 09

History, Effect of scaling, Fabrication Techniques: Oxidation, Physical Vapor disposition, Chemical Vapor Deposition, Lithography, Etching, Wafer bonding, LIGA, DRIE, and Applications: Labon chip.

Prescribed Text Books:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, WBolton, 3/e Pearson Education Press, 2018. ISBN: 9781292250977
2. Devadas Shetty and Richard A Kolk, Mechatronic System Design, 2/e, Cengage learning, 2010. ISBN: ISBN-13 : 978-1439061985
3. Clarence W. de Silva, Mechatronics an Integrated Approach, CRC Press, 2005. ISBN: 0203611640, 9780203611647

Reference Books:

1. James J Allen, Micro Electro Mechanical Systems Design, CRC Press, Taylor & Francis group, 2005. ISBN-10 : 9780824758240
2. Ganesh S Hedge, Mechatronics, Jones & Bartlett Learning, 2010. ISBN, 1934015296, 978193401529

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Explain to role of mechatronics in industry and applications of mechatronics in automation industry. | L3 |
| 2. Understand signal conditioning and its application. | L4 |
| 3. Know the different types of sensors and actuators in industry. | L4 |
| 4. Understand the architecture of microprocessors, microcontrollers and PLC | L1 |
| 5. Illustrate the application of MEMS in industry. | L1 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A37DT.1 | 3 | 3 | - | - | - | - | - | - | 3 | - | 3 | - | - | - | - |
| 19A37DT.2 | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| 19A37DT.3 | - | - | - | - | 2 | - | - | - | 2 | - | - | - | - | - | - |
| 19A37DT.4 | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| 19A37DT.5 | - | 2 | - | - | 2 | - | - | - | - | - | - | - | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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| | | |
|---|---|---|
| Title of the Course | : | Fundamentals of Robotics |
| Category | : | OE |
| Course Code | : | 19A37KT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To acquire the knowledge on Robotics and its performance
- To develop the ability of kinematics and dynamics of Robots
- To acquire the knowledge on trajectory planning and manipulator
- To develop the ability on various sensor integration on robot
- To develop the ability to use the programming and tools for operation of robot

Unit 1 Introduction to Robotics 11

Types and components of a robot, Classification of robots - Robotics, Robots-Anatomy, Structure and classification, Robot performance parameters – resolution, accuracy and repeatability, Arm and wrist configuration - Social issues and safety

Unit 2 Robot Kinematics and Dynamics 11

Description of links and joints, Kinematic modeling of manipulator, Translation and Rotation Representation, Coordinate transformation, Denavit - Hartenberg (DH) notation, Examples of DH notation, Jacobian, Singularity, and Statics.

Unit 3 Trajectory Planning and Manipulator 08

Control Terminology, Steps in trajectory planning, Joint space techniques, path description, Use of polynomials as interpolating function, various trajectories, Introduction to Cartesian space techniques.

Unit 4 End effectors, sensors and vision system 08

Tools as end effectors, Robot Grippers - Types of Grippers, Design aspect for gripper, Force analysis for various basic gripper system. Sensors for Robots - Characteristics of sensing devices, Classification, applications and selection of sensors. Robotic vision system, image acquisition, spatial and amplitude digitization, image processing and analysis.

Unit 5 Robot programming and applications 10

Robot applications in material handling, machine loading/unloading, assembly, inspection and processing. Robot Programming – Methods, Lead through methods, Robot Programming-Language overview, commands for elementary operations

Prescribed Text Books:

1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014. ,

ISBN - 0070140014
2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006. ISBN - 9780195673913
3. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi. 2001. ISBN - 0130613096

Reference Books:

1. Tsuneo Yoshikawa, Foundations of Robotics, MIT Press. Roy. 2010. ISBN - 0262514583
2. Mittal R.K. and Nagrath I.J., “Robotics and Control”, Tata McGraw Hill. 2017, ISBN - 9780070482937
3. Mukherjee S., “Robotics and Automation”, Khanna Publishing House, Delhi. 2017. 2017, ISBN - 9386173751

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand the concept of Robots, Structure and its specifications. | L2 |
| 2. Solve robot forward and inverse kinematic problems. | L5 |
| 3. Carry out trajectory planning and joint modeling for the simple robotic system. | L4 |
| 4. Identify appropriate end effectors and sensors for particular application | L4 |
| 5. Execute various steps robot programming and Knowledge will be gained on application of Robotics used in various sectors. | L4 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A36FT.1 | 3 | 3 | 3 | - | - | 3 | 3 | 3 | - | - | - | - | - | - | - |
| 19A36FT.2 | 2 | 2 | 2 | - | - | 2 | - | 2 | - | - | - | - | - | - | - |
| 19A36FT.3 | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - | - | - | - | - |
| 19A36FT.4 | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - | - | - | - | - |
| 19A36FT.5 | 2 | - | 2 | - | - | 2 | - | 2 | - | 2 | - | - | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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| | | |
|---|---|---|
| Title of the Course | : | Non-conventional sources of energy |
| Category | : | OE |
| Course Code | : | 19A37LT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | 0 | 3 |

Course Objectives:

- To grasp the role and potential of new and renewable source
- To recognize the principle, storage and applications of solar energy
- To understand the sources and potentials of wind energy and also to comprehend the Principles of Bio-Conversion of bio-mass and bio-gas uses.
- To explain the principle, working procedure and types of geothermal energy, ocean energy and tidal & wave energy.
- To know the knowledge on direct energy conversion.

Unit 1 Principles Of Solar Radiation 09

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation , potential in India

Unit 2 Solar Energy Collectors 09

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Solar Energy Storage And Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion, potential in India.

Unit 3 Wind Energy 08

Sources and potential in India, horizontal and vertical axis wind mills, performance characteristics, Betz criteria. Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, and economic aspects, potential in India

Unit 4 Geothermal Energy 08

Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics, potential in India.

Unit 5 Direct Energy Conversion 09

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and

Joule Thomson effects, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions

Prescribed Text Books:

1. Tiwari and MK.Ghosal, Renewable energy resources: Basic principles and applications, Narosa publications 2005, ISBN 10: 1842651250 ISBN 13: 9781842651254
2. G.D. Rai, Non-Conventional Energy Sources, khanna publications, 2011, ISBN 10: 8174090738, ISBN 13: 9788174090737

Reference Books:

1. Twidell & Weir, Renewable Energy Sources, Routledge , 3rd Ed.2015,ISBN 9780367200756
2. Non Conventional Energy Resources, B.H.Khan, McGrawHIll, 2015, ISBN 1259081397, 9781259081392

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Create awareness on role and potential of new and renewable source and basics of solar energy. | L2 |
| 2. acquire the knowledge on different types of collectors and storage systems of solar energy and their applications. | L2 |
| 3. Able to achieve sufficient knowledge on Wind energy and Bio-mass energy. | L2 |
| 4. Familiarize the student with the Geothermal and Ocean energy concepts and their potentiality | L2 |
| 5. Gain the knowledge on direct energy conversion | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A37ET.1 | 3 | 2 | - | - | - | 3 | 3 | - | - | - | - | 3 | - | - | - |
| 19A37ET.2 | 3 | 3 | - | 1 | 3 | 3 | - | - | - | - | - | 3 | - | - | - |
| 19A37ET.3 | 3 | 2 | 3 | - | - | 3 | 3 | - | - | - | - | 3 | - | - | - |
| 19A37ET.4 | 3 | 3 | - | - | 3 | 3 | - | - | - | - | - | 3 | - | - | - |
| 19A37ET.5 | 3 | 3 | - | - | 3 | 3 | - | - | - | - | - | 3 | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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| | | |
|---|---|---|
| Title of the Course | : | Electronic Circuits and its Applications |
| Category | : | OE |
| Course Code | : | 19A47GT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: The course aims to provide the student with the ability

- To analyze and design the transistor and feedback amplifiers.
- To understand and analyze the concepts of oscillators, linear and nonlinear wave shaping circuits.

Unit 1 : SMALL SIGNAL ANALYSIS OF AMPLIFIERS 14

Introduction to h-parameter model, Small Signal model of BJT, Analysis of CB, CE and CC configurations using h-parameters – simplified hybrid model – miller's theorem – dual of miller's theorem. Analysis of Cascaded Transistor Amplifiers- RC Coupled amplifier, Frequency response of RC Coupled, Direct coupled and Transformer coupled amplifiers.

Unit 2 : FEEDBACK AMPLIFIERS 14

Concept of Feedback, Classification of feedback amplifiers, Transfer Gain with feedback, General characteristics of negative feedback amplifiers. Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components (Topologies).

Unit 3 : OSCILLATORS 10

Condition for oscillations. Oscillator Types, Frequency and amplitude stability of oscillators, LC oscillators- Hartley and Colpitts oscillators, RC-phase shift and Wien bridge oscillators, Crystal Oscillators

Unit 4 : LARGE SIGNAL AMPLIFIERS 9

Classifications, Class A power Amplifiers- Direct coupled and Transformer Coupled, Class B power Amplifiers- Push-pull and Complementary Symmetry-Transistor power dissipation, Power and Efficiency calculations.

Unit 5 : LINEAR AND NON LINEAR WAVE SHAPING 12

High pass & low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and Exponential inputs. Diode and Transistor clippers and clampers, clamping circuit theorem.

Prescribed Text Books:

1. J. Millman and Christos C. Halkias- "Integrated Electronics", Mc Graw-Hill, 1972.
2. Robert T. Paynter- "Introductory Electronic Devices and Circuits", Pearson Education, 7th Edition.
3. J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, second edition, 2007.

Reference Text books:

1. Robert L. Boylestad and Louis Nashelsky - “Electronic Devices and Circuits Theory”, Pearson/Prentice Hall, 9th Edition, 2006.
2. Donald A. Neumann- “Electronic Circuit Analysis and Design”, Mc Graw Hill.
3. Anand Kumar, “Pulse and Digital Circuits”, PHI, 2005.Second Edition.

Course Outcomes:

| Upon completion of the course, student can | Blooms Level of Learning |
|---|---|
| 1. Analyze the single stage amplifiers using h-parameter model at low frequencies. | L4 |
| 2. Understand the feedback amplifiers and oscillators. | L2 |
| 3. Analyze the concepts of large signal amplifiers. | L4 |
| 4. Design and analyze linear and nonlinear wave shaping circuits. | L6 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A46GT.1 | 3 | 3 | 2 | 3 | 3 | 1 | - | - | 2 | - | - | - | 2 | 3 | - |
| 19A46GT.2 | 1 | 3 | 3 | 2 | 2 | - | - | - | 2 | - | - | - | 3 | - | - |
| 19A46GT.3 | 3 | 3 | 3 | 2 | 2 | 1 | - | - | 2 | - | - | - | 2 | 3 | - |
| 19A46GT.4 | 2 | 2 | 2 | - | - | - | - | - | 2 | - | - | - | 2 | 3 | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Basics of Communication Systems |
| Category | : | OE |
| Course Code | : | 19A47HT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: This course will able to

- Design simple systems for generating and demodulating AM, DSB, SSB and VSB signals.
- Understand the concepts in Angle modulation for the design of communication systems.
- Design simple systems for generating and demodulating frequency modulated signals.
- Learn the concepts of random process and various types of noise.
- Analyze pulse modulation and sampling techniques.

Unit 1 : AMPLITUDE MODULATION 10

AMPLITUDE MODULATION: Introduction, Amplitude Modulation: Time & Frequency – Domain description, Switching modulator, Envelop detector. DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

SINGLE SIDE–BAND AND VESTIGIAL SIDEBAND METHODS OF MODULATION: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

Unit 2 : ANGLE MODULATION 10

ANGLE MODULATION: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

Unit 3 : RANDOM VARIABLES & PROCESS 10

RANDOM VARIABLES & PROCESS: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions.

NOISE: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth

Unit 4 : NOISE IN ANALOG MODULATION 10

NOISE IN ANALOG MODULATION: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM

Unit 5 : DIGITAL REPRESENTATION OF ANALOG SIGNALS 10

DIGITAL REPRESENTATION OF ANALOG SIGNALS: Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise, Pulse– Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing , Application to Vocoder

Prescribed Text Books:

**1.Communication Systems**, Simon Haykins & Moher, 5th Edition, John Willey, India Pvt. Ltd, 2010,

Reference Text books:

**1.Modern Digital and Analog Communication Systems**, B. P. Lathi, Oxford University Press., 4th edition.

2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008,

3. **Principles of Communication Systems,** H.Taub & D.L.Schilling, TMH, 2011.

4. **Communication Systems,** Harold P.E, Stern Samy and A.Mahmond, Pearson Edition, 2004.

5. **Communication Systems: Analog and Digital**, R.P.Singh and S.Sapre: TMH 2nd edition, 2007.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Determine the performance of analog modulation schemes in time and frequency domains. | L4 |
| 2. Determine the performance of systems for generation and detection of modulated analog signals. | L4 |
| 3. Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms. | L3 |
| 4. Characterize the influence of channel on analog modulated signals | L3 |
| 5. Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems. | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A46HT.1 | 3 | 1 | - | - | - | 1 | - | - | - | 3 | - | 2 | 3 | 2 |
| 19A46HT.2 | 3 | 3 | 1 | - | - | 1 | - | - | - | 2 | - | 2 | 3 | 2 |
| 19A46HT.3 | 2 | 3 | - | 1 | - | 2 | - | - | - | 2 | - | 2 | 3 | 2 |
| 19A46HT.4 | 2 | 1 | 3 | - | - | 2 | - | - | - | 2 | - | 2 | 3 | 2 |
| 19A46HT.5 | 3 | 3 | 1 | - | - | 1 | - | - | - | 2 | - | 2 | 3 | 2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET**

(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Artificial Intelligence |
| Category | : | OE |
| Course Code | : | 19A57ET |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: This course will

- To comprehend the building blocks of AI in terms of intelligent agents.
- To understand the main approaches of artificial intelligence such as heuristic search, game search and logical inference.
- To know how decision theory and planning is processed on the agents.
- To verify the different types of objects in uncertain world for an agent
- To identify the solution in uncertain knowledge with reasoning.

Unit 1 : Introduction to Artificial Intelligence 9

Introduction to AI, History of AI, Emergence of Intelligent Agents, Intelligent Agents: PEAS- Representation for an Agent, Types of Agents, Types of Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Defining the Problem as a State Space Search, Problem Characteristics.

Unit 2 : Problem Solving 12

Solving problems by searching, Problem Formulation, Uninformed Search Techniques- DFS, BFS, Iterative Deepening, Comparing Different Techniques, Informed search methods – heuristic Functions, Hill Climbing, Simulated Annealing, A*, Performance Evaluation. Constrained Satisfaction Problems: Constraint Satisfaction Problems like – map Coloring, Crypt Arithmetic, Backtracking for CSP, Local Search.

Unit 3 : Knowledge and Reasoning 9

A knowledge Based Agent, Introduction To Logic,Propositional Logic, Reasoning in Propositional logic, First Order Logic: Syntax and Semantics, Extensions and Notational Variation, Inference in First Order Logic, Unification, Forward and Backward chaining, Resolution.

Unit 4 : Knowledge Engineering and Planning 11

Knowledge Engineering: Ontology, Categories and Objects, Mental Events and Objects.

Planning: Planning problem, Planning with State Space Search, Partial Order Planning, Hierarchical Planning, Conditional Planning.

Unit 5 : Uncertain Knowledge and Reasoning 10

Uncertain Knowledge and Reasoning: Uncertainty, Acting Under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Belief Networks, Simple Inference in Belief Networks,Fuzzy Logic.

Prescribed Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Publication.
2. Rich, E. and Knight, K., "Artificial Intelligence", Tata McGraw-Hill.

Reference Books:

1. George Lugar, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
2. Robert J. Schalkolf, Artificial Intelligence: an Engineering approach, McGraw Hill, 1990.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand the importance of artificial Intelligence in real world environment | L2 |
| 2. Apply the artificial intelligence algorithms for problem solving | L3 |
| 3. Analyze the various reasoning and knowledge representation techniques | L4 |
| 4. Solve the problems using classification and planning techniques | L3 |
| 5. Apply knowledge and reasoning techniques in uncertain environment for obtaining solution | L3 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A56IT.1 | 3 | 3 | - | - | - | 3 | - | - | 3 | 2 | - | 2 |
| 19A56IT.2 | 3 | 3 | 3 | 3 | - | 3 | 2 | - | 3 | - | - | 2 |
| 19A56IT.3 | 3 | 3 | 3 | 3 | - | 3 | - | - | 3 | 2 | - | - |
| 19A56IT.4 | 3 | 3 | 3 | 3 | 1 | 3 | 2 | - | 3 | - | - | - |
| 19A56IT.5 | 3 | 3 | 3 | 3 | - | 3 | - | - | 3 | - | - | - |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET**

(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Cyber Security |
| Category | : | OE |
| Course Code | : | 19A57FT |
| Year | : | IV B.Tech |
| Semester | : | I |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: This course will able to

- Remember Cyber Security architecture principles
- Compare different classes of attacks
- Understand about cybercrime with mobile and wireless devices
- Apply tools and methods used in cybercrime
- Understand about cyber security and social media marketing.

Unit 1 : INTRODUCTION: 10

Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, The Legal Perspectives, Indian Perspectives, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

Cyber offenses: Introduction of Criminal Planning and Criminal Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

Unit 2 : CYBERCRIME MOBILE AND WIRELESS DEVICES: 10

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit 3 : TOOLS AND METHODS USED IN CYBERCRIME: 9

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft(ID Theft)

Unit 4 : CYBERCRIMES AND CYBER SECURITY: 9

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

Unit 5 : UNDERSTANDING COMPUTER FORENSICS: 10

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics

Prescribed Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

Reference Text Books:

1. Information Security, Mark Rhodes, Ousley, MGH.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press

Web References:

1.https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm

Course Outcomes

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Remember Cyber Security architecture principles | L1 |
| 2. Compare different classes of attacks | L2 |
| 3. Understand about cybercrime with mobile and wireless devices | L2 |
| 4. Apply tools and methods used in cybercrime | L3 |
| 5. Understand about cyber security and social media marketing | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A56JT.1 | 3 | 3 | 3 | - | 3 | - | - | 3 | - | - | 3 | - |
| 19A56JT.2 | - | 3 | - | 3 | - | 3 | - | - | 3 | - | - | 3 |
| 19A56JT.3 | 3 | - | - | 3 | - | - | 3 | 3 | - | 3 | - | 3 |
| 19A56JT.4 | 3 | 3 | 3 | - | 3 | - | - | - | - | - | 3 | 3 |
| 19A56JT.5 | - | - | 3 | 3 | 3 | - | - | - | 3 | - | 3 | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

Title of the course : Power Systems Lab
Category : PC
Course code : 19A273L
Year : IV B.Tech
Semester : I

| Lecture Hours | Tutorial hours | Practical | Credits |
|---|---|---|---|
| - | - | 2 | 1 |

Any Ten Experiments:

1. Characteristics of IDMT Over Current Relay (Electromagnetic Type).
2. Characteristics of Negative Phase Sequence relay (Static Type).
3. Characteristics of Percentage biased differential Relay (static type).
4. Characteristics of Over Voltage Relay (Electromagnetic Type).
5. Characteristics of over voltage/under voltage relay (Micro processor Based Type).
6. Characteristics of Percentage Biased Differential Relay (Electromagnetic Type).
7. Determination of ABCD parameters of transmission lines
8. Determination of regulation and efficiency of a transmission line
9. Ferranti effect
10. Separation of No-Load Losses of Three Phase Squirrel cage Induction motor.
11. Equivalent Circuit of three winding transformer.
12. Power Angle Characteristics of Salient pole Synchronous machine.
13. Determination of Sub transient Reactance of Salient pole Synchronous Machine.
14. Study of Radial Feeder
15. Study of Time Grading
16. Determination of Sequence Impendence of Three phase alternator
17. Fault Analysis of Three phase alternator
18. Study the effect of solar panels connected in (i) series (ii) parallel (iii) series-parallel
19. Wind Speed measurement

Course Outcomes: By the end of this course, students will be able to — Blooms Level

1. Understand the performance relay of operation — L1
2. Understand the Performance of Transmission lines — L1
3. Analyze the performance of ac machines — L3
4. Analyze the performance of renewable Energy sources — L3

COs-POs-PSOs Mapping:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A273L .1 | 3 | 3 | 3 | 3 | 3 | - | - | - | 3 | - | 3 | 3 | 3 | 3 |
| 19A273L .2 | 3 | 3 | 3 | 3 | 3 | - | - | - | 3 | - | 3 | 3 | 3 | 3 |
| 19A273L .3 | 3 | 3 | 3 | 3 | 3 | - | - | - | 3 | - | 3 | 3 | 3 | 3 |
| 19A273L .4 | 3 | 3 | 3 | 3 | 3 | - | - | - | 3 | - | 3 | 3 | 2 | 2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET**
**(AN AUTONOMOUS INSTITUTION)**

Title of the Course: Microprocessors and Microcontrollers Lab

Category: PC

Course Code: 19A274L

Year: IV B.Tech

Semester: I

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| - | - | 2 | 1 |

Any Ten of the following experiments are to be conducted

Microprocessor 8086

**1.** Unsigned Arithmetic operations (Addition, subtraction, multiplication, division)
**2.** Signed Arithmetic operations (Addition, subtraction, multiplication, division)
**3.** ASCII – arithmetic operation.
**4.** Logical Operations
a) Code conversion – BCD to ASCII.
b) Number of 1's and 0's in a given word.
c) Packed BCD to unpacked BCD Conversion.
**5.** String Operations
a) Relocate a string of N words/bytes.
b) Reverse String.
c) String Insertion
d) String Deletion
**6.** Ascending and descending order of numbers using Near Procedure, Factorial of a given number.
**7.** Interfacing with 8255 PPI
a. DAC Interfacing: Square wave generation in BSR mode, I/O mode.
b. Triangular, sinusoidal and Stair wave generation in I/O mode.
**8.** Stepper Motor Interfacing: Rotation in Clock wise and Anti-clock wise direction.

Microcontroller 8051:

**9.** Arithmetic operations – Addition, Subtraction, Multiplication and Division.
**10.** Reading and writing a port.
**11.** Serial communication implementation.
**12.** Square wave generation using Timer.

Course Outcomes: By the end of this course, students will be able to Blooms Level

1. Write Assembly Language programming of 8086 microprocessor.
2. Understand programmable peripheral devices and their Interfacing programs with 8086.
3. Write Assembly Language programming of 8051 microcontroller.

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A274L .1 | 3 | 3 | - | - | 3 | - | - | - | - | - | - | 3 | 3 | 3 |
| 19A274L .2 | 1 | 1 | - | 1 | 1 | - | - | - | - | - | - | 1 | 3 | 3 |
| 19A274L .3 | 2 | 2 | - | - | 2 | - | - | - | - | - | - | 2 | 3 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET

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Title of the course : Design of Electrical Systems
Category : PE
Course Code : 19A28AT
Year : IV B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To learn basic principles of Domestic and Industrial Installations.
- To understand the need for power factor improvement and cable sizing.
- To be familiar with the reasons for earthing and selection of proper earthing system in Power System.
- To study the Power Quality issues and economic aspects in electrical system design.

Unit 1 Domestic Installations 8

Standard Wire Gauge – Size and current carrying capacity of wire - Classification of building services, design aspects of lighting, design aspects of ventilation, design aspects of vertical transportation – Classification of residential buildings - estimation of load requirements - selection of type of wiring – pre-commissioning tests - Electric shock and effects.

Unit 2 Industrial Installations 9

Types of service mains – selection of service mains - classification of industrial installation - selection of distribution architecture, selection of transformers and sub stations – calculation of voltage regulation of distribution transformer - Selection of switch gears: electrical protection, protection of circuit elements and equipments, Switching devices, fuses – Indian Electricity rules: general safety precautions.

Unit 3 Cable sizing and Power factor improvement 9

Choice of material used in cables - current carrying capacity of cable – Short circuit rating – voltage drop calculations in cables - Power factor, methods of improving power factor, economics of power factor improvement, location of capacitors, optimal compensation, PF correction of induction motors.

Unit 4 Power System Earthing 9

Introduction, earthing, types of system earthing, reasons for grounding/earthing, TN system, TT system, IT system, protective measures and protective devices in IT system - selection criteria for earthing - measurement of earth resistance, earth leakage protection – Residual Current Devices (RCD) – Selection and types of RCD.

UNIT 5 Power Quality Issues and Resonance Problems in Systems Design 8

Power quality issues, harmonics- sources of harmonics - disturbances caused by harmonics - methods to reduce the impact of harmonics - design the detuned capacitor bank - IEEE 519-1992 Voltage distortion limits – Time Value of Money-Single Payment Compound Amount Model (SPCA), Uniform Series Compound Amount Model (USCA), Uniform Series Present Worth Model (USPW) - Depreciation - Numerical problems.

Prescribed Text Books:

**1.** M.K. Giridharan. Electrical Systems design. I.K. International Publishing house Pvt. Ltd.
**2.** Er. V.K. Jain and Er. Amitabh Bajaj. Design of electrical Installations. University Science press.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Understands the basics on which building services are classed, various joints and its procedure, and selection of wiring for a residential buildings | L1 |
| 2. Understand selection of service mains and distribution architecture, and general safety precautions | L1 |
| 3. Able to calculate cable size and capacitor rating to improve the power factor | L4 |
| 4. To know reasons for grounding/earthing, selection of proper earthing system in power system. | L1 |
| 5. Understand economic aspects of electrical system design, able to solve problems relating to energy economics and depreciation | L1 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A28AT .1 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 3 | - | - | 3 | 3 | - |
| 19A28AT .2 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 3 | - | - | 3 | 2 | 3 |
| 19A28AT .3 | 3 | - | - | - | 3 | 3 | - | - | 3 | - | - | 3 | 3 | 2 |
| 19A28AT .4 | 3 | 3 | 3 | - | 3 | 3 | - | - | 3 | - | - | 3 | 3 | 3 |
| 19A28AT .5 | 3 | 3 | 3 | - | 3 | 3 | - | - | 3 | - | 2 | 3 | 3 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course : Distributed Energy Systems
Category : PE
Course Code : 19A28BT
Year : IV B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives: This course will able to

- illustrate the concept of distributed generation
- analyze the impact of grid integration
- study concept of Micro grid and its configuration
- find optimal size, placement and control aspects of DGs

Unit 1 : Need for distributed generation 8

Renewable sources in distributed generation – Current scenario in distributed generation – Planning of DGs – Siting and sizing of DGs – Optimal placement of DG sources in distribution systems.

Unit 2 : Grid integration of DGs 10

Different types of interfaces – Inverter based DGs and rotating machine based interfaces – Aggregation of multiple DG units – Energy storage elements – Batteries, ultra capacitors, flywheels.

Unit 3 : Technical impacts of DGs 10

Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems.

Unit 4 : Economic and control aspects of DGs 9

Market facts, issues and challenges – Limitations of DGs – Voltage control techniques, Reactive power control, Harmonics, Power quality issues – Reliability of DG based systems – Steady state and Dynamic analysis.

Unit 5 : Introduction of DGs in micro-grids 8

Types of micro-grids – Autonomous and non-autonomous grids – Sizing of micro-grids – Modeling & analysis – Micro-grids with multiple DGs

Prescribed Text Books:

**1.** H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000.

**2.** M.GodoySimoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.

**3.** Robert Lasseter, Paolo Piagi, ' Micro-grid: A Conceptual Solution', PESC 2004, June 2004.

Reference books:

**1.** F. Katiraei, M.R. Iravani, 'Transients of a Micro-Grid System with Multiple Distributed Energy Resources', International Conference on Power Systems Transients (IPST'05) in Montreal, Canada on June 19-23, 2005.

**2.** Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson, 'Facility Microgrids', General Electric Global Research Center, Niskayuna, New York, Subcontract report, May 2005.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Find the size and optimal placement of DG | L1 |
| 2. Analyze the impact of grid integration and control aspects of DGs | L3 |
| 3. Model and analyze a micro grid taking into consideration the planning and operational issues of the DGs to be connected in the system | L4 |
| 4. Describe the technical impacts of DGs in power systems | L1 |

CO-PO Mapping:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A28BT.1 | 3 | 2 | - | - | - | - | - | - | 3 | - | 3 | - | 3 | - |
| 19A28BT.2 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| 19A28BT.3 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - |
| 19A28BT.4 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET

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| | |
|---|---|
| Title of the Course | Energy Auditing And Demand Side Management |
| Category | PE |
| Course Code | 19A28CT |
| Year | IV B.Tech |
| Semester | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Prerequisites: Courses on Electrical Measurements and Transmission & Distribution.

Course Objective: Principles of energy conservation, audit and management; Energy efficient motors, lighting, economics.

Unit 1 Energy Audit and Management Principles: 9

Energy Situation – world and India, energy consumption, conservation, codes,standards and Legislation.

Energy audit - definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, energy conservation schemes - energy audit of industries energy saving potential, energy audit of process industry, building energy audit.

Unit 2 Energy Conservation Principles: 9

Rules for efficient energy conservation - technologies for energy conservation - Energy scenario, principles of energy conservation, resource availability, energy savings, and current energy consumption in India, roles and responsibilities of energy managers in industries.

Unit 3 Energy Efficient Motors And Lighting: 8

Energy efficient motors - factors affecting efficiency, loss distribution, constructional details, characteristics, variable speed, variable duty cycle systems, motor energy audit. Lighting: Good lighting system design and practice, lighting control, lighting energy audit.

Unit 4 Energy Instruments And Economic Analysis: 9

Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, PLCs and applications.

Energy Economic Analysis- The time value of money concept. Cash flow models, payback analysis, depreciation, taxes and tax credit - numerical problems.

Unit 5 Demand Side Management: 8

Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM - time of day pricing, multi-utility power exchange model, and time of day models for planning. Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and organization of energy conservation awareness programs.

Prescribed Text Books:

1. W.R. Murphy & G. Mckay Butter worth, Energy management, Butter worth-Heinemann publications, 2nd edition, 2016.
2. Albert Thumann, William J. Younger, Handbook of energy audits, Taylor & Francis Ltd, 7th edition, 2008.
3. UmeshRathore, Energy management, S.K. Kataria& Sons, 2nd edition, 2014.

Reference Books:

1. W.C.Turner, Stevedoty, Energy management hand book, CRC press, 6th edition, 2006. 2. D.P. Sen, K.R. Padiyar, IndraneSen, M.A. Pai, Recent Ad vances in Control and Management of Energy Systems, In terline Publisher, Bangalore, 1993.
2. Ashok V. Desai, Wiley Eastern, Energy Demand - Analysis, Management and Conservation Hand book on energy auditing - TERI (Tata Energy Research Institute), 2005.
2. Craig B. Smith, Kelly E. Parmenter, Energy management principles Applications, benefits, Savings, Elsevier Inc(Pergamon Press), 1st edition, 2016.

| Course Outcomes: By the end of this course, students will be able to | Blooms Level |
|---|---|
| 1. Demonstrate knowledge on Energy Situation, Energy auditing practices, conservation schemes and Energy economics and management. | L3 |
| 2. Analyze Demonstrate skills in design for good lighting system and energy efficient motors. | L3 |
| 3. Analyze various energy instruments, Payback analysis, depreciation, taxes and tax credit. | L2 |
| 4. Familiarize demand side management practices | L3 |

COs-POs-PSOs Mapping Table

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 19A28CT.1 | 2 | - | - | - | - | 2 | 2 | 2 | 2 | 2 | - | 2 | 2 | - |
| 19A28CT.2 | 2 | - | 2 | - | - | 2 | 2 | 2 | - | - | - | 2 | 2 | - |
| 19A28CT.3 | 2 | 2 | - | - | - | 2 | - | - | - | - | 2 | 2 | 2 | - |
| 19A28CT.4 | 2 | - | - | - | - | 2 | 2 | 2 | 2 | - | - | 2 | - | 2 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)
Department of Civil Engineering

Title of the Course: Disaster Management
Category : OE
Course Code : 19A18DT
Year : IV B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:
The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

Unit 1 : (6hrs)
INTRODUCTION - Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, prevention, mitigation).

Unit 2 : (10hrs)
DISASTERS - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit 3 : (9hrs)
DISASTER IMPACTS - Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and National disaster trends; climate-change and urban disasters.

Unit 4 : (9hrs)
Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.
DISASTER RISK REDUCTION (DRR) - Disaster management cycle–its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation,food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Unit 5 : (9hrs)

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Prescribed Text Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. The students increase the knowledge and understanding of the disaster phenomenon and, its factors. | L1 |
| 2. The students must learn various classification of disasters hazard and vulnerability profile of India. | L4 |
| 3. The students will learn impacts, global and national disaster trends | L2 |
| 4. The students will learn disaster management cycle and its phases and DRR programmes in India and activities of national disaster management academy. | L3<br>L6 |
| 5. The students should be able to analyze factors affecting vulnerability of developmental projects and environmental modifications for sustainable development. | |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A18DT.1 | - | - | - | - | 2 | 1 | - | 2 | 2 | 2 | - | - | - | - | - |
| 19A18DT.2 | 1 | - | - | - | - | - | - | 2 | 3 | 3 | - | 2 | - | - | - |
| 19A18DT.3 | 1 | - | - | - | - | 3 | - | 3 | 2 | 2 | - | - | - | - | - |
| 19A18DT.4 | - | - | - | - | - | - | - | 3 | 3 | 3 | - | 2 | - | - | - |
| 19A18DT.5 | 1 | - | - | - | - | - | 2 | 3 | - | - | - | 3 | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course: Building Planning and Construction
Category : OE
Course Code : 19A18ET
Year : IV B.Tech
Semester : II

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives:

- Teach to supervision of different types of masonry
- Illustrate the methodology in selection of materials, design and supervision of suitable type of floor and roof
- To ensure the student to be aware of building byelaws.
- To make the student to understand about principles of planning, standards and requirements of Residential building and Public building

Unit 1 : Building Byelaws and Regulations (8hrs)
Introduction –Terminology –Objectives of building byelaws –Floor area ratio (FAR) –Floor space Index (FSI) –Principles underlying building byelaws –classification of buildings –Open space requirements –built up area limitations –Height of Buildings –Wall thickness –lighting and ventilation requirement.

Unit 2 : *Planning of Residential buildings* (10hrs)
Minimum standards for various parts of buildings –requirements of different rooms and their grouping – characteristics of various types of residential buildings. Principles of planning- architectural principle, Aspects of planning within and with respect to surroundings, Modular planning concept.

Unit 3 : *Planning of* Public buildings (10hrs)
Planning of Educational institutions, hospitals, dispensaries, Office buildings, banks, industrial buildings, hotels and motels, buildings for recreation. Elements of Perspective Drawing: Definition, concept and single and two point perspective

Unit 4 : Building components*& foundations* (9hrs)
Building components: Lintels, Arches, and stair cases – Types. Different types of floors-Concrete, Mosaic, Terrazo floors, Pitched, flat and curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs-King and Queen Post Trusses. RCC Roofs.
Foundations: Shallow foundations – Spread, combined, strap and mat foundations.

Unit 5 : (8hrs)
Masonry: Types of masonry, English and Flemish bonds, Rubble and Ashlar masonry, cavity and partition walls.
Finishings: Damp proofing- materials used. Plastering, pointing, white washing and distempering – Painting

– Constituents of a paint – Types of paints – Painting of new/old Wood – Varnish – Form work and scaffolding.

PrescribedText Books:

1. Building Planning & Drawing by Dr N. Kumaraswamy and A.Kameswara Rao, Charitor Publications.
2. Planning and Designing and Scheduling- Gurucharan Singh and Jagadish Singh – Standard Publishers.
3. Planning and Designing of Buildings – Y.S.Sane.
4. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
5. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
6. National Building Code of India.

Reference Text books:

1. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S. K. Kataria & Sons
2. R.Chudly "Construction Technology "– Volumes I and II" 2nd Edition, Longman, UK, 1987.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand Building Byelaws & regulations. | L2 |
| 2. Understand principles of planning, standards and requirements for residential building. | L2 |
| 3. Understand principles of planning, standards and requirements for public building. | L2 |
| 4. Summarize different types of masonry and foundations | L3 |
| 5. Understand different types of building components and finishing works | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A18ET.1 | - | - | - | - | - | 3 | 1 | - | 2 | - | - | - | - | 2 | 3 |
| 19A18ET.2 | - | - | - | - | - | 3 | 1 | - | 2 | - | - | - | - | 2 | 3 |
| 19A18ET.3 | - | - | - | - | - | 3 | 1 | - | 2 | - | - | - | - | 2 | 3 |
| 19A18ET.4 | - | - | - | - | - | 3 | 1 | - | 2 | - | - | - | - | 2 | 3 |
| 19A18ET.5 | - | - | - | - | - | 3 | 1 | - | 2 | - | - | - | - | 2 | 3 |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Entrepreneurship Development |
| Category | : | OE |
| Course Code | : | 19A38ET |
| Year | : | IV B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | - | 3 |

Course Objectives:

- To develop and strengthen entrepreneurial quality and motivation in students
- To impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Unit 1 **Entrepreneurship** 09

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

Unit 2 Motivation 09

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

Unit 3 **Business** 10

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Unit 4 **Financing And Accounting** 09

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

Unit 5 **Support To Entrepreneurs** 09

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting

Prescribed Text Books:

1. Khanka. S.S., “Entrepreneurial Development” S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013. ISBN : 81-219-1801-4
2. Donald F Kuratko, “Entreprenuership – Theory, Process and Practice”, 9th Edition, Cengage

Learning, 2014. ISBN-10: 1285051750

Reference Books:

1. Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013. ISBN 1843769964
2. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis” 2nd Edition Dream tech, 2005. ISBN 81-297-0260-6
3. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011. ISBN 10: 0198072635
4. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986. ISBN 0-07-026694-8

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand the basic concepts of entrepreneurship | L2 |
| 2. Understand the importance of motivation for entrepreneur | L2 & L3 |
| 3. Gain knowledge and skills needed to run a business successfully. | L3, L4 & L5 |
| 4. Learn the concepts of financing and accounting | L3 |
| 5. Understand the basic concepts of various supporting process | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A35KT.1 | 3 | - | - | - | - | - | - | - | 3 | 3 | - | 2 | - | - | - |
| 19A35KT.2 | 3 | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - |
| 19A35KT.3 | 3 | - | - | - | - | 2 | - | 2 | 2 | 3 | - | 3 | - | - | - |
| 19A35KT.4 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | - | - | - | - | - |
| 19A35KT.5 | 3 | - | - | - | - | - | - | - | 3 | 3 | - | - | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Optimization in Engineering |
| Category | : | OE |
| Course Code | : | 19A38FT |
| Year | : | IV B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | 0 | 3 |

Course Objectives:

- To enable the students to the nature and scope of various decision making situations within business contexts, understand and apply operations research techniques to industrial applications.
- To learn the fundamental techniques of Operations Research and to choose a suitable OR technique to solve problem

Unit 1 12

Linear Programming: Problem Formulation, Graphical solution, Simplex method, Artificial variables techniques -Two–phase method, Big-M method – Duality Principle

Unit 2 12

Transportation Mode: Formulation, Optimal solution, unbalanced transportation problem, Degeneracy.
Assignment Model: Formulation, Optimal solution, Variants of Assignment Problem, Travelling Salesman problem.

Unit 3 09

Theory of Games: Introduction – minimax - maximin – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – m X 2, 2 X n & m x n games -Graphical method, Dominance principle

Unit 4 : 07

Waiting Lines: Introduction – single channel – Poisson arrivals – exponential service times – with infinite queue length models.
Simulation: Definition – Types of simulation models – phases of simulation– applications of simulation – Queuing problems – advantages and disadvantages – Simulation languages.

Unit 5 : 08

Inventory: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks
Dynamic Programming: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem

Prescribed Text Books:

1. PS Gupta, DS Hira, Operations Research, S Chand Publications, 10th Edition, 2016, ISBN-13978-8121902816
2. S.D. Sharma, Operations Research, Kedarnath and Ramnath Publications, 2012, ISBN-135551234001596

Reference Books:

1. Taha, *Introduction to Operations Research*. PHI, 10 th edition, 2016, ISBN-13978-0134444017
2. R. Panneerselvam, *Operations Research.* PHI Publ, 2nd edition, 2004, ISBN: 9788120319233

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Develop mathematical models of the real life situations and capable of solving them for obtaining best solutions | L3 |
| 2. Solve the special cases of LPP like Transportation problems, Assignment and Travelling salesmen problems | L3 |
| 3. Choose the best strategy out of the available strategies in the competition or game | L3 |
| 4. Apply the fundamentals of waiting lines in real life situations and can Simulate queuing models | L3 |
| 5. Understand and will apply the fundamentals of inventory in real life situations and can apply Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems | L3 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A38FT.1 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | - |
| 19A38FT.2 | 3 | 2 | 2 | - | - | - | 2 | - | - | - | - | - | - | - | - |
| 19A38FT.3 | 3 | 2 | 2 | - | - | - | 2 | - | - | - | - | - | - | - | - |
| 19A38FT.4 | 3 | 2 | 2 | - | - | 2 | 2 | - | - | - | - | - | - | - | - |
| 19A38FT.5 | 3 | 2 | - | - | - | 2 | 2 | - | - | - | - | - | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Total Quality Management |
| Category | : | OE |
| Course Code | : | 19A38GT |
| Year | : | IV B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | - | 0 | 3 |

Course Objectives:

- To introduce the students, the basic concepts of Total Quality Management.
- To expose with various quality issues in Inspection.
- To gain Knowledge on quality control and its applications to real time.
- To know the extent of customer satisfaction by the application of various quality concepts.
- To understand the importance of Quality standards in Production.

Unit 1 Introduction 10

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

Unit 2 Historical Review 09

Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

Unit 3 TQM Principles 08

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies

Unit 4 TQM Tools 09

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

Unit 5 Quality Systems 08

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Prescribed Text Books:

1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2018, ISBN: 9789332534452
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Education., 2012, ISBN: 1259001415, 9781259001413
3. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017, ISBN: 9781351407786

Reference Books:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, NewAge International, 1996, ISBN-10: 8122416802.
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993, ISBN: 9780471939672.
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015, ISBN, 0070241147, 9780070241145.
4. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995, ISBN: 9780749415617.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Develop an understanding on quality Management philosophies and frameworks. | L2 |
| 2. Adopt TQM methodologies for continuous improvement of quality. | L3 |
| 3. Measure the cost of poor quality, process effectiveness and efficiency to identify areas for improvement. | L4 |
| 4. Apply benchmarking and business process reengineering to improve management processes. | L3 |
| 5. Determine the set of indications to evaluate performance excellence of an organization. | L3 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A37GT.1 | 2 | - | - | - | - | 2 | 2 | - | - | - | 2 | 1 | - | - | - |
| 19A37GT 2 | 2 | 2 | - | 2 | - | 2 | - | - | - | 1 | 2 | 1 | - | - | - |
| 19A37GT 3 | 1 | 2 | - | 2 | - | - | - | 1 | 1 | 1 | 2 | 1 | - | - | - |
| 19A37GT 4 | 1 | - | - | - | - | 1 | - | - | - | - | 2 | 1 | - | - | - |
| 19A37GT 5 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | - | - | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

| | | |
|---|---|---|
| Title of the Course | : | Introduction to Digital Design |
| Category | : | OE |
| Course Code | : | 19A48DT |
| Year | : | IV B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: The course aims to provide the student with the ability

- To get the knowledge on Number Systems and codes.
- To gain the knowledge on Boolean algebra.
- To acquire the knowledge of various circuits in Digital design.

Unit 1 : Number systems, Codes & Boolean Algebra 14

Philosophy of number systems – r, (r-1)"s complement, representation of negative numbers, binary arithmetic, binary codes, error detecting & error correcting codes, hamming codes. Boolean algebra: Fundamental postulates of Boolean algebra, Basic theorems and properties, digital logic gates, properties of XOR gate, universal gates.

Unit 2 : Switching Functions and Their Minimization 14

Switching Functions-Canonical and Standard forms, algebraic simplification using Boolean theorems, two level & Multilevel Realization of Boolean Functions using Universal Gates. Minimization: K-Map methods, Prime implicants, don"t care combinations, Minimal SOP and POS forms, Tabular Method, Prime-Implicants chart, simplification rules

Unit 3 : Combinational Logic Design & Programmable Logic Devices 10

Design using conventional logic gates-Binary Adders, Subtractors, Ripple Adder, carry Look Ahead adder, Magnitude comparator, Encoder, Decoder, Multiplexer, De-Multiplexer, Code converters. PLD's: ROM, PROM, PLA, PAL, and Realization of Switching functions using PLD"s. Comparison between PLA, PAL, ROM.

Unit 4 : Sequential Circuits 9

Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples),Basic flip-flops, Triggering and excitation tables, flip flop conversions, Steps in synchronous sequential circuit design, Design of modulo-N Synchronous counters – up/down counter, ring counter, Johnson counter

Unit 5 : FSM Minimization and ASM Chart 12

Finite state machine- capabilities and limitations, Mealy and Moore models and their conversions Sequence detector, Serial binary adder. Minimization of completely specified sequential machines-Partition techniques. Salient features of the ASM chart, Simple examples

Prescribed Text Books:

1. Morris Mano, Digital Design. Prentice Hall India, 3 rdEd.
2. ZVI Kohavi and Niraj K. Jha Switching & Finite Automata theory. Tata McGraw Hill, 3 rdEd.

Reference Text books:

1. Charles H. Roth, Fundamentals of Logic Design. Thomson Publications, 2004, 5 th Ed.
2. Fletcher, an Engineering Approach to Digital Design. Prentice Hall India.
3. Anand Kumar, Switching Theory and Logic Design. Prentice Hall India, 2008.

Course Outcomes:

| Upon completion of the course, student can | Blooms Level of Learning |
|---|---|
| 1. Understand different number systems conversions & Binary codes | L2 |
| 2. Simplify Boolean functions& realize them using digital logic gates. | L5 |
| 3. Design various combinational & sequential circuits. | L6 |
| 4. Understand the Minimization techniques of Finite State Machine & the elements of ASM chart. | L2 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A48DT.1 | 2 | 3 | 2 | - | 2 | - | - | 1 | - | - | 2 | - | 3 | - | - |
| 19A48DT.2 | 2 | 2 | 2 | - | - | 1 | - | 1 | - | - | 2 | - | 2 | 2 | - |
| 19A48DT.3 | 2 | 2 | 2 | - | - | 1 | - | 1 | - | - | 2 | - | - | 3 | - |
| 19A48DT.4 | 2 | 2 | 2 | - | - | 1 | - | 1 | - | - | 2 | - | - | 3 | - |

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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| | | |
|---|---|---|
| Title of the Course | : | Industrial Electronics |
| Category | : | OE |
| Course Code | : | 19A48ET |
| Year | : | IV B.Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: This course will able to

- Power quality terminology, power quality issues, classification
- Different sources of power quality disturbances
- Harmonic distortion; Principles for controlling harmonics
- Power quality measuring equipment; Power quality monitoring standards
- Impact of distributed generation on power quality

Unit 1 : INTRODUCTION TO POWER QUALITY 8

Power Quality- definition, terminology, issues, evaluation procedure, responsibilities of the suppliers and users of electric power, power quality standards, CBEMA and ITI curves.

Unit 2 : POWER QUALITY DISTURBANCES 10

General classes of power quality problems- Impulsive and oscillatory transients. Long duration voltage variations - over voltage, under voltage, sustained interruption. Short duration voltage variations- interruption, sag, swell and outage. Sources of sags and interruptions, estimating voltage sag performance overview of mitigation methods.

Unit 3 : FUNDAMENTALS OF HARMONICS 10

Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices. Harmonic sources from commercial and industrial loads. Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, and devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

Unit 4 : POWER QUALITY MONITORING 9

Power quality benchmarking, monitoring considerations, choosing monitoring locations, permanent power quality monitoring equipment, historical perspective of power quality measuring instruments. Power quality measurement equipment-types of instruments, assessment of power quality measurement data, power quality monitoring standards.

Unit 5 : DISTRIBUTED GENERATION AND GRID INTERCONNECTION 8

Distributed generation -connection requirements and impacts on the network. Interaction and optimal location of DG-Eigen analysis and voltage interaction. Power quality in DG-Mitigation of voltage dip during

motor start, harmonic effects with DG, voltage flicker and fluctuation. Islanding issues, distribution line compensation-heavy Load and Light load condition, real generation, protection issues for distributed generation, technologies for distributed generation, power quality impact from different DG types.

PrescribedText Books:

1. Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, 3rd edition, TMH Education Pvt. Ltd., 2012.
2. ArindamGhosh, Gerard Ledwich, Power quality enhancement using custom power devices, Kluwer academic publishers, 2002

Reference Text books:

1. G.T. Heydt, Electric Power Quality, Stars in a circle Publications, 1991. USA.
2. Surajit Chattopadhyaya, Madhuchhanda Mitra, Samarjit Senugupta, Electrical Power Quality, Springer Dordrecht Heidelberg London New York.
3. Math H. J. Bollen, Understanding Power quality problems, IEEE Press, 2007.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Demonstrate knowledge on sources of power quality disturbances and issues, power quality monitoring and measuring instruments, power quality standards, effect of distributed generation on power quality. | L1 |
| 2. Analyze various power quality issues. | L3 |
| 3. Design a suitable harmonic filter for commercial and industrial loads. | L4 |
| 4. Investigate various power quality issues and provide feasible solutions for improvement of power quality. | L5 |
| 5. Select and use an appropriate equipment for monitoring and measurement of power quality. | L4 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A48ET.1 | 3 | - | - | - | - | - | - | - | - | - | - | - | -3 | - | - |
| 19A48ET.2 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - | - |
| 19A48ET.3 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| 19A48ET.4 | 3 | 3 | - | - | 3 | - | - | - | - | - | - | - | - | 3 | - |
| 19A48ET.5 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | - | - | 3 | - |

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|---|---|---|
| Title of the Course | : | Internet of Things |
| Category | : | OE |
| Course Code | : | 19A58ET |
| Year | : | IV B. Tech |
| Semester | : | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: This course will able to

- Understand the terminology, technology and its applications of IoT.
- Know the concept of M2M (machine to machine) with necessary protocols.
- Memorize the software platforms which are used for developing the applications.
- Learn the concepts of python programming language which is used to develop the IoT projects.
- Know the hardware platforms which is necessary to develop the IoT applications.

Unit 1 : Introduction to Internet of Things 8

Introduction to Internet of Things, History of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, Applications of IoT.

Unit 2 : IoT and M2M & IoT Platforms Design Methodology 7

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. IoT Platforms Design Methodology: Introduction, IoT Design Methodology.

Unit 3 : The Wireless Embedded Internet 8

Introduction to 6LoWPAN, The 6LoWPAN Architecture, The Basic 6LoWPAN Format, Addressing MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol, Contiki and uIPv6, Wireless RFID Infrastructure.

Unit 4 : IoT Systems-Logical Design Using Python 8

Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages and File Handling.

Unit 5 : IoT Physical Devices and Endpoints 8

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices

Prescribed Text Books:

1. Internet of Things, A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, University Press, 2015.
2. 6LoWPAN: The WirelessEmbedded Internet, Zach Shelby and Carsten Bormann,Wiley publications, first edition,2009.(Unit III).

Reference Text books:

1. The Internet of Things Connecting Objects to the Web, Hakima Chaouchi,Wiley publications,2010.

2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley 2014.
3. Enterprise IoT, A Definitive Handbook by Naveen Balani.

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Understand the vision of IoT from a global context. | L1 |
| 2. Identify the difference between IoT and M2M communication. | L3 |
| 3. Determine the usage of 6LoWPAN and select the appropriate network protocols for IoT project. | L4 |
| 4. Develop the IoT experiments with the help of Python programs. | L5 |
| 5. Design the IoT applications using Raspberry Pi kit. | L6 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A572T .1 | - | - | - | 3 | 3 | 3 | 2 | 2 | - | - | - | 2 | 3 | - | 3 |
| 19A572T .2 | - | - | | | 3 | - | - | - | - | 1 | - | - | 3 | 3 | - |
| 19A572T 3 | - | - | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 19A572T 4 | - | - | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 19A572T 5 | 2 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | | - | 3 |

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|---|---|
| Title of the Course | Web Programming |
| Category | OE |
| Course Code | 19A58FT |
| Year | IV B. Tech |
| Semester | II |

| Lecture Hours | Tutorial Hours | Practical | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Objectives: This course will make the students

- Interpret and use HTML concepts in developing the web pages
- Use the CSS to design web pages.
- Interpret the JavaScript programming language
- Interpret the JavaScript framework using JQuery

Unit 1 : 7

Structuring Documents for the Web-A Web of Structured Documents, Introducing HTML5, Tags and Elements, Attribute Groups Core Attributes, Internationalization, Core Elements ,Basic Text Formatting, Understanding Block and Inline Elements, Grouping Content, Working with Lists, Text Processing tags, Links and Navigation :Basic Links, Understanding Directories and Directory Structures, Understanding URLs, Creating In-Page Links with the <a> Element.

Unit 2 : Images, Audio, and Video, Tables, Forms 7

Images, Audio, and Video -Adding Images Using the <img> Element, Using Images as Links Adding Flash, Video, and Audio to Your Web Pages Tables: Introducing Tables, Basic Table Elements and Attributes, adding a Caption to a Table, Grouping Sections of a Table, Nested Tables, Accessible Tables. Forms: Introducing Forms, creating a Form with the <form> Element, Form Controls, Creating Labels for Controls and the <label> Element, Structuring Your Forms with <fieldset> and <legend> Elements, Focus, Disabled and Read-Only Controls, Sending Form Data to the Server, Creating More Usable Form Fields.

Unit 3 : Cascading Style Sheets, Introduction to XML 7

Cascading Style Sheets: Introducing CSS, Where You Can Add CSS Rules, CSS Properties Controlling Text, Text Formatting, Text Pseudo-Classes, Styling Text, Selectors Lengths, Introducing the Box Model, An Example Illustrating the Box Model, Links, Backgrounds, Lists, Tables, And Miscellaneous Properties.
Introduction to XML: Difference between HTML and XML, Basic structure and Syntax of XML Document, DTD, sample examples.

Unit 4 : Learning JavaScript 7

Learning JavaScript-Introduction to JavaScript, How to Add a Script to Your Pages, comments in JavaScript, Create an External JavaScript ,The Document Object Model, JavaScript Programming console, General Programming Concepts, Variables, Operators, String Operators (Using + with Strings), Functions, Conditional Statements, Looping, Events, Built-in Objects.

Unit 5 : Working with jQuery 7

Working with jQuery: introduction to jQuery, adding jQuery to Your Page, jQuery Basics, jQuery and the DOM, Managing Events with jQuery, Ajax with jQuery, jQuery UI.

Prescribed Text Books:

1. Beginning HTML and CSS Rob Larsen, Wrox Programmer to Programmer.

Reference Books:

1. JavaScript and JQuery: Interactive Front-End Web Development, Jon Duckett, Wiley Publications
2. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, Wiley Publications
3. jQuery in Action, Bear Bibeault, Yehuda Katz, and Aurelio De Rosa, Third Edition, Manning Publications
4. https://www.w3schools.com/

Course Outcomes:

| Student will be able to | Blooms Level of Learning |
|---|---|
| 1. Interpret and Use the fundamental HTML markups when designing web pages. | L2, L3, L5 |
| 2. Use and design the web pages with images, audio, videos, tables and form controls. | L3, L5 |
| 3. Use cascading style sheets and XML concepts to design web pages | L3, L5 |
| 4. Interpret and use JavaScript concepts in designing web pages | L2, L3, L5 |
| 5. Interpret and use JQuery concepts in designing web pages. | L2, L3, L5 |

CO-PO Mapping:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19A534T.1 | 3 | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 | 3 |
| 19A534T.2 | - | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 | 3 |
| 19A534T.3 | - | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 | 3 |
| 19A534T.4 | 3 | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 | 3 |
| 19A534T.5 | 3 | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 | 3 |