# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE301 | Subject Title | CONTROL SYSTEM | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DC | Year | 3rd | Semester | V |

**Objectives of the Course**

- To introduce the state variable representation of continuous and discrete data control systems, stability analysis and time response analysis using state model,
- The concepts of controllability and observability, basic concepts of digital control systems, their stability analysis,
- Use of state feedback for pole placement design, basic concepts and stability analysis of non linear systems

| | | |
|---|---|---|
| Unit 1 | **The Control System:** Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback | 8L |
| Unit 2 | **Time Response analysis:** Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants. Controllers: Introduction to P, PI, & PID controller. performance indices | 8L |
| Unit 3 | **Control System Components**: Constructional and working concept of ac servomotor, synchros and stepper motor. **Concept of Stability:** Routh-Hurwitz criteria, Root Locus Technique | 8L |
| Unit 4 | **Frequency response Analysis:** Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots: gain margin and phase margin. **Stability in Frequency Domain:** Nyquist stability criterion, relative stability. | 8L |
| Unit 5 | **Introduction to Design:** The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. | 8L |

**Text Books:**

1. I.J. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.

**Reference Books**

1. Norman S. Nise, Control System Engineering 4th edition, Wiley Publishing Co.
2. M.Gopal, "Control System; Principle and design", Tata McGraw Hill.
3. M.Gopal," Modern Control system", Tata McGraw Hill.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

**Outcome of the Course:**

- Possess in-depth knowledge of concepts from classical control theory, understand the concept of transfer function.
- Find out the time response of a given system and design of different basic controller (P, PI, PID)
- Understand the basic knowledge of servo & servomotor.
- Gain knowledge of finding out system stability in time and frequency domain.
- To draw different plots of control system and compensation design using these plots.

**List of Experiments**

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/S input characteristics
7. To determine speed-torque characteristics of an ac servomotor.

8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behaviour of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

**Software based experiments (Use MATLAB, LABVIEW software etc.)**

1. To determine time domain response of a second order system for step input and obtain performance parameters.
2. To convert transfer function of a system into state space form and vice-versa.
3. To plot root locus diagram of an open loop transfer function & determine range of gain 'k' for stability.
4. To plot a Bode diagram of an open loop transfer function.
5. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system.

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE302 | Subject Title | ELEMENTS OF POWER SYSTEM | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DC | Year | 3rd | Semester | V |

**Objectives of the Course**

- To give an overview of power system and its various components and their importance.
- Calculation of line parameters, evaluation of line performance
- Mechanical aspects of overhead transmission line, underground cables, their constructional features

**Unit 1** **POWER SYSTEM COMPONENTS:** Single line diagram of Power System, Supply system, Different types of supply system and their comparison, Transmission line configurations, Types of conductors, Skin effect, Kelvin's law, Proximity effect. **8L**

**Unit 2** **OVER HEAD TRANSMISSION LINES:** Calculation of inductance and capacitance of single phase, three phase, single circuit, and double circuit transmission lines. Representation of short, medium and long transmission lines, Ferranti effect, Surge impedance loading **8L**

**Unit 3** **CORONA AND LINE Insulators**: Corona formation, calculation of potential gradient, corona loss, factors affecting corona, Methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines. Types of insulators and their application, Potential distribution over a string of insulators, Methods of equalizing the potential, String efficiency **8L**

**Unit 4** **Mechanical Design of Transmission Lines:** Catenary curve, Calculation of sag & tension, Effects of wind and ice loading, Sag template, Vibration dampers, Types of towers and their design **8L**

**Unit 5** **Insulated Cables:** Types of cables and their construction , Dielectric stress, Grading of cables, Insulation resistance, Capacitance of single phase and three phase cables, Dielectric losses, Heating of cables. **8L**

**Text Books:**


1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill, USA
2. C.L. Wadhwa, "Electrical Power Systems", New Age International Ltd., Third Edition
3. Ashfaq Husain, "Power System", CBS Publishers & Distributors, India
4. B.R. Gupta, "Power System Analysis & Design", S.Chand & Co, Third Edition
5. M.V. Deshpande, " Electrical Power System Design", Tata McGraw Hil


**Reference Books**


1.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, India
2.S.L. Uppal, " Electric Power", Khanna Publishers
3.S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI, New Delhi


**Outcome of the Course:**

- The students should be able to know about the overhead and underground types of transmission systems,
- The students should be able to know about different mathematical models to represent different types of transmission lines and evaluate their performance.
- They should also be able to design an overhead transmission line including mechanical aspects.
- They will also know about different types of cables used in case of electrical power systems.

| List of Experiments | MATLAB based |
|---|---|
| 1. To compute line parameters for a single phase transmission line | |
| 2. To compute line parameters for a three phase short transmission line | |
| 3. To compute line parameters for a three phase medium transmission line | |
| 4. To compute line parameters for a three phase long transmission line | |
| 5. Verification of Ferranti Effect for Different Length Transmission Lines | |
| 6. To calculate sag in case of transmission lines | |
| 7. To calculate voltage regulation of transmission line using MATLAB | |
| 8. To carry out modelling of 3 phase AC cable | |
| 9. | |

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EC204 | Subject Title | ELECTROMAGNETIC FIELD THEORY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 4 | Subject Category | DC | Year | 3rd | Semester | V |

**Objectives of the Course**

- The concept of electromagnetic field
- The electromagnetic wave and their propagation
- Transmission lines and wave guides.

| | | |
|---|---|---|
| **Unit 1** | **COORDINATE SYSTEMS AND TRANSFORMATION:** Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates Vector Calculus: Differential Length, Area and Volume, Line Surface and Volume Integrals, Del Operator, Gradient of a Scalar, Divergence of a Vector and Divergence Theorem, Curl of a Vector and Stoke's Theorem, Laplacian of a Scalar. | **8L** |
| **Unit 2** | **ELECTROMAGNETIC WAVE PROPAGATION:** Faraday's Law, Electromotive Forces, Displacement Current, Derivation of Maxwell's Equations For Static and Time-Varying Fields, Differential and integral forms, concept of displacement current, Boundary conditions. | **8L** |
| **Unit 3** | **ELECTROMAGNETIC WAVE PROPAGATION APPLICATIONS:** Electromagnetic Wave Propagation: Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Wave in Free Space, Plane Waves in Good Conductors, Power and The Poynting Vector, Reflection of a Plane Wave at Normal incidence. | **8L** |
| **Unit 4** | **TRANSMISSION LINES:** Transmission Lines: Transmission Line Parameters, Transmission Line Equations, Input Impedance, Standing Wave Ratio and Power, Smith Chart, Some Applications of Transmission Lines, Low loss RF and UHF transmission lines, Distortion less condition. Transmission line charts-impedance matching | **8L** |
| **Unit 5** | **WAVEGUIDES:** Wave Guides: Introduction to Planar (Rectangular) Waveguides, Derivation of TE and TM Modes, TEM Mode, Impedance and characteristics impedances. Transmission line analogy for wave guides, Attenuation and factor of wave guides, Resonators. | **8L** |

**Text Books:**


1.M N O Sadiku, 'Elements of Electromagnetics'.

2.William Hayt, 'Engineering Electromagnetics', McGraw-Hill


**Reference Books**


1. .John Kennedy, 'Electronic Communication Systems', Tata McGraw Hill, 4th edition.

2. K. D. Parsad, 'Electromagnetic Fields'.


**Outcome of the Course:**

- **The students will understand the nature of electric field and magnetic field.**
- **The students will be able to analyse and solve the problems involving the electromagnetic waves.**

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EC341 | Subject Title | TRANSDUCERS AND INSTRUMENTATION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Electives | Year | 3rd | Semester | V |

**Objectives of the Course**

- To make students understand the Identification, classification construction, working principle and application of various transducers used for Displacement measurement, Temperature measurement, Level measurement, and Miscellaneous measurement
- To make the students learn the selection procedure, applications and comparative study of various Transducers
- To understand the role of the various elements of a measurement system and to specify and evaluate a measurement system for a given application
- To make the students evaluate the technological and physical limitations of a specific sensor and
- propose a suitable sensor for a given measurement situation.

| | | |
|---|---|---|
| **Unit 1** | **Transducers:** Definition, principle of sensing & transduction, classification, Static and Dynamic characteristics. Mechanical and Electro-mechanical sensors: Resistive Transducers – potentio-metric type (linear and logarithmic), Strain gauge- resistive and semiconductor type, rosettes. Inductive sensors - Reluctance type, Mutual inductance, LVDT: Construction, material, I/O curve, applications, RVDT, Hall Effect Sensor. Capacitive transducers - variable distance-parallel plate type, variable area-parallel plate, cylindrical type, and variable dielectric constant type. Piezoelectric element: piezoelectric effect, materials. | **8L** |
| **Unit 2** | **Thermal Sensors:**Classification, Bimetallic Thermometer, Resistance thermometer (RTD), , Thermistors, Thermocouples – Principle of working, Thermoelectric Laws, Radiation Pyrometers, Optical Pyrometers, Pyrometers, Liquid Crystal Thermometer, Digital Thermometer. | **8L** |
| **Unit 3** | **Pressure Sensors:** Types, Manometers, Bourdon Tube – C Type, spiral type, Helical Type, Bellows, Diaphragms, Pressure Measurement using: LVDT, Potentiometer, Photoelectric Transducer. | **8L** |
| **Unit 4** | **Opto-Electronic Sensors:** Photo-emissive transducer, Photo-Conductive Transducer, Photo-Voltaic Transducer, Applications of Photo Diode and Photo Transistors as transducers, Optical encoders, Stroboscope, Fibre Optic Sensors. | **8L** |
| **Unit 5** | **Miscellaneous Measurements**:Measurements of Liquid Level, Measurement of Humidity, Measurement of pH value, Sound measurement of using Microphone, ultrasonic sensors, Measurement of Nuclear Radiations: Geiger Muller Tube, Scintillation detectors, MEMS Sensors, Introduction to Smart Sensors. | **8L** |

**Text Books:**


1. D. Patranabis, “Sensors and Transducers,” 2nd edition, Prentice Hall of India Private Limited
2. Ian R. Sinclair, “ Sensors & Transducers”, 3rd Edition, Newnes Publications.
3. E.O. Doebelin and Dhanesh N Manik, “Measurement Systems,” 6th Edition, McGraw Hill Education, India


**Reference Books**


1. B.C. Nakra & K. Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition.
2. A.K. Sawhney and Puneet Sawhney,“Mechanical Measurements & Instrumentation & Control,” Dhanpat Rai & Co., India
3. D.V.S. Murthy, “Transducers and Instrumentation,” Prentice Hall of India Private Limited (2003).


**Outcome of the Course:**

- Working principles of sensors and transducers.
- Measurement of physical quantities like displacement, temperature, pressure, etc.
- Applications of various transducers used in industry.
- Analyze smart sensors for their relevant applications.

**List of Experiments**

1.Measurement of unknown resistance with the help of a dc potentiometer.
2.To determine the characteristics of LVDT
3.To determine the characteristics of RVDT.
4.Measurement of strain using strain gauge.
5.Measurement of load using strain gauge based load cell.
6.Temperature measurement using thermocouple.
7.Temperature measurement using RTD.
8.Pressure measurement using Bourdon Tube.
9.Measurement of speed using Stroboscope/optical encoder.
10.Displacement measurement using IR Sensor.

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE342 | Subject Title | TELEMETRY AND DATA TRANSMISSION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Elective | Year | 3rd | Semester | V |

**Objectives of the Course**

- To study about various digital modulation techniques
- To study about data handling and data reception systems
- To study about various control systems used and the types of command system
- To study about telemetry systems

Sampling Fundamentals: Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate. Alising Errors.

**Unit 1** Digital Modulation Techniques: Review of PCM, DPCM, Methods of binary data transmission, Data Formats, DM code converters, PSK, QPSK, FSK, probability of error, phase ambiguity resolution and differential encoding, error detection, error correction, error correction codes. **8L**

**Unit 2** Data Handling System: Block schematic, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC- range and resolution, Word Format, Frame format, Frame synchronizer codes, R. F. links, X24, RS 422, RS423, RS 232C interfaces, Multi terminal configuration, Multiplier & Concentrator, Data Modems, Data transmission over telephone lines. **8L**

**Unit 3** Data Reception Systems: Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems. **8L**

**Unit 4** Remote Control: Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory automation. **8L**

Command: Tone command system, Tone digital command system, ON/OFF command and data commands.

**Unit 5** Aerospace Telemetry: Signal formation and conversion, Multiplexing techniques in telecontrol, Industrial telecontrol installations, reliability in telecontrol installations. **8L**

**Text Books:**

1. Patranabis," Telemetry Principles: Tata Mcgrew Hill.
2. Schweber," Data Communication " Mcgraw Hill.

**Reference Books**

1.. Berder & Menjewlse," Telemetry Systems".

**Outcome of the Course:**

- To have knowledge about data sampling and digital modulation techniques used
- To have knowledge and understanding of requirements for data handling and data analysis
- To have knowledge about the techniques to be used for data transmission using various techniques

**List of Experiments**

1. To plot the Characteristics of Strain gauge
2. To plot the Characteristics of load cell
3. To plot the Characteristics of thermistor
4. To plot the Characteristics of RTD
5. To plot the Characteristics of Thermocouple
6. To study the Loading effect of Potentiometer
7. To plot the Characteristics of Synchros
8. To plot the Characteristics of LVDT
9. To plot the Characteristics of Piezo-electric transducer

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE343 | Subject Title | DYNAMIC SYSTEM ANALYSIS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Elective | Year | 3rd | Semester | V |

**Objectives of the Course**

- To study the mathematical model of systems
- To study time response analysis
- To study the frequency analysis

| | | |
|---|---|---|
| **Unit 1** | **Control Concepts and Mathematical Modelin**g System Concepts, Effect of Feedback, System Modeling, Transfer Function, Modeling of Different Types of Physical Systems, Analogy between the Elements of Different Types of Systems. State Variable Representation. Relationship between State Model and Transfer Function. | **8L** |
| **Unit 2** | **System Representation and Control Component**s Block Diagram Algebra. Signal Flow Graph and Mason's Gain Formula. State Diagram and Simulation. Introduction to Simulink. Working Principle and Control Applications of Synchros, Tachogenerator, Servomotor and Stepper Motor. | **8L** |
| **Unit 3** | **Time Response Analysis**: Time response of First Order and Second Order Systems. Steady State Error and Error Coefficients. State Transition Matrix and Solution of State Equations. Concepts of Stability–Routh-Hurwitz Criterion of Stability. Root Locus Technique. | **8L** |
| **Unit 4** | **Frequency Response Analysis** Correlation between Time and Frequency Response. Frequency Response of Second Order System. Bode Plots, Polar Plots, Nichols Chart and Nyquist Stability criterion – Gain Margin and Phase Margin. | **8L** |
| **Unit 5** | **Control System Design** Cascade and Feedback Compensation – Design of Lag, Lead, Lag-Lead Compensator Using Bode Plot and Root Locus. Introduction to P, PI and PID Controllers and their Tuning. | **8L** |

**Text Books:**

1.Norman S. Nise, "Control Systems Engineering", Wiley Eastern, 2007.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India 2003.

**Reference Books**

1. B.C. Kuo, "Automatic Control Systems", Prentice Hall of India, 2002.

**Outcome of the Course:**

- Apply the knowledge about the Automatic Control System to use them more effectively.
- Fulfill the demands of the industry about the analysis and control of the dynamic systems.
- Describe the State Space Analysis and use it for the stability analysis of the dynamic systems.
- Differentiate different types of controllers and design them for specific applications.
- Design Lag, Lead, Lag-Lead Compensator using Bode Plot and Root Locus techniques and suggest the relative stabilities of different dynamic systems.

**List of Experiments**

1. To convert a given first order system from transfer function model to state space model.
2. To calculate transfer function of a RLC circuit and study its transient response.
3. To study transient and steady state response of a $1^{st}$ order system
4. To study transient and steady state response of a $2^{nd}$ order system
5. To study transient and steady state response of a higher order system
6. To analyse stability of a given plant using root locus.
7. To analyse stability of a given plant using Routh-Hurwitz criteria and Bode plot
8. To design a P controller for a given system
9. To design a PI controller for a given system
10. To design a PID Controller for a given system

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE344 | Subject Title | UTILIZATION OF ELECTRICAL ENERGY & TRACTION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 4 | Subject Category | Elective | Year | 3rd | Semester | V |

**Objectives of the Course**

- To introduce the fundamentals of various types of electrical heating and electrical welding applications.
- To introduce the fundamentals of refrigeration, air conditioning and illumination engineering
- To have knowledge about the types of electric traction systems and the fundamentals related to electric traction
- To have knowledge about the types of electric drives and their control mechanisms specially when used in electric traction

| | | |
|---|---|---|
| **Unit 1** | **Electric Heating:** Advantage & methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating, | **8L** |
| **Unit 2** | **Electric Welding:** Electric arc welding, electric resistance welding, Electric Welding control, **Electrolyte Process:**Principal of Electro deposition, laws of Electrolysis, application Electrolysis. | **8L** |
| **Unit 3** | **Illumination:** Various definition, laws of Illumination, requirement of good lighting, Design of indoor lighting & outdoor lighting system. **Refrigeration and Air Conditioning**: Refrigeration system, domestic Refrigerator, water cooler, Types of Air conditioning, Window air conditioner | **8L** |
| **Unit 4** | **Electric Traction – I :** Types of electric traction, system of track electrification, Traction mechanics-types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence | **8L** |
| **Unit 5** | **Electric Traction – II :** Salient features of traction drives, Series-parallel control of dc traction drives (bridge traction) and energy saving, Power Electronic control of dc & ac traction drives, Diesel electric traction. | **8L** |

**Text Books:**


1. H.Pratab. "Art & Science of Electric Energy's" Dhanpat Rai & Sons.
2. G.K.Dubey," Fundamentals of electric drives" Narosa Publishing house.


**Reference Books**


1.H.Pratab."Modern electric traction" Dhanpat Rai & Sons.

2.C.L. Wadhwa,"Generation, Distribution and Utilization of Electrical Energy "New Age International Publishers.


**Outcome of the Course:**

- Have the knowledge of various types of methods used for heating and welding
- A student should be able to select a suitable heating method depending on the types of material to be heated
- Have proper knowledge of different welding methods and electroplating.
- Electroplating and its applications
- A student should be able to design the lighting system for various applications.
- Have understanding of Different types of traction systems particularly electric traction system, types of services and their characteristics

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE345 | Subject Title | MODERN CONTROL SYSTEM | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Elective | Year | 3rd | Semester | V |

**Objectives of the Course**

- To study about discrete data systems
- To study state space analysis involving concepts of controllability and observability
- To study different types of stability methods.

| | | |
|---|---|---|
| **Unit 1** | **Discrete Data Systems:** Introduction to discrete time systems, sample and hold circuits, pulse transfer function, representation by differential equations and its solution using z-transform and inverse-z transforms, analysis of LTI systems, unit circle concepts. | **8L** |
| **Unit 2** | **State Space analysis:** State equations for dynamic systems, State equations using phase, physical and canonical variables, realization of transfer matrices, Solution of state equation, concepts of controllability, observability, Controllability and Observability tests. | **8L** |
| **Unit 3** | **Non-linear System & Linearization:** Introduction to non-linear system and their state variable representation. Linearization, describing function of various non-linearities. Stability analysis using describing function. | **8L** |
| **Unit 4** | **Stability**: Liapunov's method, generation of Liapunov's function, Popov's criteria, design of state observers and controllers, adaptive control systems, model reference. | **8L** |
| **Unit 5** | **Optimal Control**: Introduction , formation of optimal control problems, calculus of variation, minimization of functions, constrained optimization, dynamic programming, performance index , optimality principles, Hamilton – Jacobian equation, linear quadratic problem, Ricatti II equation and its solution, solution of two point boundary value problem | **8L** |

**Text Books:**


1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
2. M. Gopal, "Modern Control System", Wiley Eastern.
3. Stefani, Shahain, Savant, Hostetter, "Design of feedback control system", oxford university press.


**Reference Books**


1. B.D.O. Anderson and IB. Moore, " Optimal Control System: Linear Quadratic Methods", Prenctice Hall International.
2. U. Itkis, "Control System of Variable Structure", John Wiley and Sons.
3. H. Kwakemaok and R. Sivan, "Linear Optimal Control System", Wiley Interscience.


**Outcome of the Course:**

- **Should be able to convert a given system into a state space model**
- **Should be able to check for a given system whether it is controllable and observable or not**
- **Should be able to apply Liapunovs method and popovs methods and optimal control for control of system**

**List of Experiments**

1. To convert a given system of 2nd order from transfer function model to state space model
2. To convert a 3rd order system from transfer function model to state space model
3. To check the controllability of a given system
4. To check the observabiility of a given system
5. To assess the stability of a 2nd order system using Liapunovs method
6. To assess the stability of a 2nd order system using Popovs method
7. To solve problems based on constrained optimization
8. To solve problems based on two point boundary problems

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE346 | Subject Title | WIND AND SOLAR ENERGY SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Elective | Year | 3rd | Semester | V |

**Objectives of the Course**

- Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
- Understand the basic physics of wind and solar power generation.
- Understand the power electronic interfaces for wind and solar generation.
- Understand the issues related to the grid-integration of solar and wind energy systems.

| | | |
|---|---|---|
| **Unit 1** | **Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions. | **5L** |
| **Unit 2** | **Wind generator topologies**: Review of modern wind turbine technologies,Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control. | **12L** |
| **Unit 3** | **The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability. **Solar photovoltaic:**Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms.Converter Control. | **11L** |
| **Unit 4** | **Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems. | **8L** |
| **Unit 5** | **Solar thermal power generation:** Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis. | **3L** |

**Text Books:**


1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.
3. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
4. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.


**Reference Books**


1. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
2. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.


**Outcome of the Course:**

- To be able to apply the concepts of renewable energy sources for electricity generation
- To be able to apply the concepts of grid integration with renewable sources
- To evaluate the options and estimate the energy generation through renewable sourceso be able to

**List of Experiments** **MATLAB based**

1. Analysis of Solar Photovoltaic panel Characteristics
2. Modelling of Solar Array
3. Design and Simulation of Solar PV Model
4. Solar cell modelling and study of characteristics
5. To study modelling of solar power converter
6. To study a grid connected PV array for high power rating
7. To study the effect of change in parameters of wind turbine on power output

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | EE347 | Subject Title | HIGH VOLTAGE ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 4 | Subject Category | Elective | Year | 3rd | Semester | V |

**Objectives of the Course**

- To introduce the basic concepts of high voltage engineering including mechanism of electrical breakdown in gases, liquids and solids,
- To understand high voltage ac/dc and impulse generation and measurement,
- To have knowledge about overvoltage's and their causes, importance of insulation coordination
- To understand measurement of partial discharges and loss tangent, high voltage testing and condition monitoring of power equipment's

| | | |
|---|---|---|
| Unit 1 | **Break Down In Gases** Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, breakdown in non- uniform field, breakdown in vacuum.<br>**Break Down In Liquid Dielectrics Classification** of liquid dielectric, characteristics of liquid dielectric, breakdown in pure liquid and commercial liquid.<br>**Break Down In Solid Dielectric** Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics. | **8L** |
| Unit 2 | **Generation of High Voltage and Currents:** Generation of High direct Current Voltage, Generation of high voltage alternating voltages, generation of impulse voltages generation of impulse currents, tripping and control of impulse generators. | **8L** |
| Unit 3 | **Measurement of High Voltage and Currents:** Measurement of High direct Current Voltages, Measurement of High alternating & Impulse voltages, Measurement of High direct, alternating & Impulse Currents, Cathode ray Oscillographs for impulse voltage and current measurements. | **8L** |
| Unit 4 | **Over Voltage Phenomenon & insulation Coordination:** Lighting Phenomenon as natural cause for over voltage, over voltage due to switching surges and abnormal conditions, Principal of insulation coordination.<br>**Non -Destructive Testing** Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements. | **8L** |
| Unit 5 | **High voltage testing:** Testing of insulator & bushing, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements. | **8L** |

**Text Books:**

1. M.S. Naidu & V. Kamraju," High voltage Engineering, Tata Mc-Graw hill.

**Reference Books**

1. E Kuffel and W.S.Zacngal , High voltage Engineering:, Pergamum Press
2. M.P Churasia, High Voltage Engineering Khanna Publishers.
3. R.S. Jha,"High voltage Engineering", Dhanpat Rai & Sons.
4. C.L. Wadhwa,"High Voltage Engineering", Wiley Eastern Ltd.
5. Subir Ray." An Introduction to High Voltage Engineering" Prentice Hall of India.

**Outcome of the Course:**

- **To analyse the breakdown mechanisms of electric breakdown in liquids, gases, and solids.**
- **To have understanding of fundamental concepts of high voltage AC, DC, and impulse generation.**
- **To be able to apply techniques for high voltage measurements and non-destructive test techniques in high voltage engineering.**
- **To become familiar with testing and condition monitoring of power equipments.**

| Subject Code | CS201 | Subject Title | Data Structures | | | | | |
|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DC | Year | 2nd | Semester | III |

**OBJECTIVE:**

The objective of this course is familiarizing the students with the different kinds of data structure used for information storage and data retrieval in different applications of computer science.

**Unit 1: Introduction to Algorithms & Data Structure (8)**

**Introduction:** Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

**Arrays:** Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

**Stacks:** Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack

**Unit 2: Queues & Link List (7)**

**Queue:** Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

**Linked Lists**: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

**Unit 3 Trees (8)**

**Trees:** Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

**Binary Search Tree:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

**Unit-4 Graphs (7)**

**Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

**Unit- 5: Searching, Sorting & File Handling**: (9)

**Searching** &**hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation

**Sorting**: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

**File Handling:** Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

**COURSE OUTCOME:**

At the end of the course, the student can:

CO1. Students develop knowledge of basic data structures for storage and retrieval of ordered or unordered data. Data structures include: arrays, linked lists, binary trees, heaps, and hash tables.

CO2. Students develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.

CO3. Students learn to analyze and compare algorithms for efficiency using Big-O notation.

CO4. Students implement projects requiring the implementation of the above data structures.

**TEXT BOOKS**

1. Schaum'souline series "Data structures" TMH. 1st Edition Indian Reprint 2014.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.1st Edition.1998

**REFERENCES**

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication,2nd Edition. 2008.
2. Robert Kruse, Data Structures and Program Design in C PHI.2nd Edition.2006.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.1st Edition.

| SR.NO. | EXPERIMENT NAME |
|---|---|
| 1 | Program in C for the implementation of Array for various operations. |
| 2 | Program in C for the creation of Stack for its various operation implementation. |
| 3 | Program in C for the creation of Queue for its various operation implementation. |
| 4 | Program in C for the creation of Link list for its various operation implementation. |
| 5 | Program in C for the creation of Circular Link list for its various operation implementation. |
| 6 | Program in C for the creation of Doubly Link list for its various operation implementation. |
| 7 | Program in C for the creation of Binary Search Tree for its various operation implementation. |
| 8 | Program in C for the Implementation of sorting Algorithms. |
| 9 | Program in C for the Implementation of basic Graph Algorithms. |

| Subject Code | CS202 | Subject Title | Java Programming Concepts | | | | | |
|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DC | Year | 2nd | Semester | III |

**OBJECTIVE:**
The objective of this course is familiarizing the students with the concepts of object oriented programming and its implementation in Java programming language.

**Unit 1: Object Oriented Programming, Static & Dynamic models (9)**

**Object Oriented Programming**: Objects and classes, generalization and inheritance, aggregation, abstract class.
**Static and dynamic models**: UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state diagram, activity diagram.

**Unit 2: Introduction to Java, Class, Objects (8)**

**Introduction to Java:** Importance and features of Java, Keywords, constants, variables and Data Types, Operators and Expressions.
**Branching and looping:** if-else, switch, while, do, for statements, jump statements: break, continue, and return.
**Introducing classes, objects and methods:** defining a class, adding variables and methods, creating objects, constructors, inheritance, overriding, final class, and use of super keyword.

**Unit 3 Arrays & Interface in Java (7)**

**Arrays and Interfaces:** Creating an array, string array, dynamic array, abstract classes, interfaces, extending interfaces, IO stream handling, and packages.

**Unit-4 Multithreading, Exception handling, Applet and AWT (8)**
**Multithreading:** Thread, thread life cycle, extending thread class, implementing runnable interface, thread synchronization.
**Exception handling:** inbuilt and user defined exceptions.
**Applet and AWT:** Introduction to applet, event handling, event classes and listeners, handling images.

**Unit- 5: Introduction to Swings (7)**

**Introduction to Swings:** Features of swings, swing UI elements, sample cases developing user interfaces using Swing UI classes, design animation, sound and video application using swings.

**COURSE OUTCOME:**
At the end of the course, the student can :
CO1. Able to learn Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2. Able to learn Java application programs using OOPS principles and proper program structuring.
CO3. Able to Java programs to implement error handling techniques using exception handling.
CO4. Able to GUI programs in java and embed with web pages.

**TEXT BOOKS**
1. Herbert Schieldt, "The Complete Reference: Java", TMH.9th Edition.2014.
2. E. Balagurusamy, "Programming in JAVA", TMH.5th Edition 2014.

**REFERENCES**

1. Booch Grady, "Object Oriented Analysis & Design with application 3/e", 3rd Edition Pearson Education, New Delhi,2009.

| SR.NO. | EXPERIMENT NAME |
|---|---|
| 1 | Program in Java to design simple calculator for (+, -, *, and /) using switch case |
| 2 | Program in Java to design accounts class and two functions withdraw() and deposit(). |
| 3 | Program in Java to show the inheritance in java and use of super keyword.. |
| 4 | Program in Java to the concept of polymorphism by designing functions to sum different type of numbers |
| 5 | Program to show the concept of method overriding in Java. |
| 6 | Program in Java that import the user define package and access the Member variable of classes that Contained by Package. |
| 7 | Program in C for the creation of Binary Search Tree for its various operation implementation. |
| 8 | Program in Java to handle the Exception using try and multiple catch block. |
| 9 | Program in Java to create a thread that Implement the Runable interface |
| 10 | Program in Java to create Frame that display the student information using awt components |
| 11 | Program in Java to create frame for course enquiry using Swings components. |

| Subject Code | CS204 | Subject Title | Database Management System | | | | | |
|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DC | Year | 2nd | Semester | III |

**OBJECTIVE:**

This course aims to educate students on the role of a well-structured relational database management system (RDBMS) to the efficient functioning of an organization. This course covers theory and practice in designing a relational database management system with example of a current database product of MYSQL. Students also learn about the important concepts of database integrity, security and availability with techniques like normalization, concurrency control and recoverability control.

**Unit 1: Introduction to Database System (8)**

**Introduction:** Data base System Applications, data base System VS file System, Data Abstraction, Instances and Schemas, data Models: the ER Model, Relational Model & Other Models , Database Languages, data base Users and Administrator, data base System Structure, Storage Manager, the Query Processor, Two/Three tier architecture.

**Unit 2: E-R modeling Data Base Design (7)**

**E-R model:** Basic concepts, Design Issues, Mapping Constraints, Attributes and Entity sets, Relationships and Relationship sets, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

**Unit 3 Relational Model & SQL (8)**

**Relational Model:** Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra

**SQL:** Form of Basic SQL Query, Nested Queries, Aggregative Operators, NULL values, Logical operators, Outer Joins, Complex Integrity Constraints in SQL.

**Unit-4 Database Design Concepts (8)**

**Database Design:** Schema refinement, Different anomalies in designing a Database, Decompositions , Problem related to decomposition, Functional Dependency, Normalization using functional dependencies, 1NF, 2NF, 3NF & BCNF , Lossless join decomposition, Dependency preserving Decomposition , Schema refinement in Data base Design, Multi valued Dependencies, 4NF, 5NF.

**Unit- 5: Transaction & Concurrency (8)**

**Transaction Management:** Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

**COURSE OUTCOME:**

At the end of the course, the student will able to learn:

CO1. To work on MySQL database management system.

CO2. To create database and query the database for information retrieval.

CO3. To design a database so that data redundancy, data inconsistency and data loss problems may be resolved.

**TEXT BOOKS**

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, TATA McGrawHill 3rd Edition,2003
2. Silberschatz, Korth, Data base System Concepts, McGraw hill, 5th edition,2005

**REFERENCES**


1. Peter Rob & Carlos Coronel, Data base Systems design, Implementation, and Management, 7thEdition,2006.
2. Elmasri Navate, Fundamentals of Database Systems, Pearson Education,7th edition 2016
3. C.J.Date ,Introduction to Database Systems, Pearson Education,8th edition,2012


| SR.NO. | EXPERIMENT NAME |
|---|---|
| 1 | Implementation of Data Definition language in Query Language. |
| 2 | Implementation of Data Manipulation in Query Language. |
| 3 | Insertion & Updation of records in Database table |
| 4 | Implementation of GROUP functions (avg, count, max, min, Sum). |
| 5 | Execution of the various type of SET OPERATORS (Union, Intersect, Minus). |
| 6 | Apply the various types of Integrity Constraints on table. |
| 7 | Creation of various types of JOINS. |
| 8 | Implementation of Views and Indices in database. |
| 9 | Implementation of foreign key on database. |
| 10 | Modify the database structure and drop the record with structure. |

| Subject Code | CS211 | Subject Title | Discrete Mathematics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 4 | Subject Category | DC | Year | 2nd | Semester | III |

**Objective:**

**T**he objectives of this course is to learn concepts of Discrete Mathematics and by applying the algorithms to solve the problems related to Recursion , combinatorial mathematics and problems on basic graph theory.

**UNIT I: Unit 1: Introduction to Sets, Relations & Functions (7)**

**Set Theory:** Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.
**Relations:** Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
**Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction.

**UNIT II: Unit 2: Posets & Introduction to Boolean algebra (6)**

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented and Complete Lattice
Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions.

**UNIT III: Groups & Rings (8)**

**Algebraic Structures**: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups Permutation and Symmetric groups, Group Homeomorphisms, Definition and elementary properties of Rings and Fields, Integers modulo n.

**UNIT IV: Propositional logic, Predicate Logic & Introduction to Probability (8)**

**Propositional Logic:** Proposition, well-formed formula, Truth tables, Tautology, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.
**Predicate Logic:** First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.
**Combinatorics:** Introduction, Counting Techniques, Pigeonhole Principle
**Probability:** Introduction, Conditional Probability & Independence

**UNIT V: Introduction to Graphs & Recurrence Relations (7)**

**Graphs:** Definition and terminology, Representation of graphs, multigraphs, bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
**Trees:** Definition, Binary tree, Binary tree traversal, binary search tree.
**Recurrence Relation & Generating function:** Recursive definition of functions, Recursive algorithms, Method of solving recurrences

**Course Outcomes:**

- An ability to perform operations on discrete structures such as sets, functions, relations, and sequences..
- An ability to construct proofs using direct proof, proof by contradiction, proof by cases, and mathematical induction.
- An ability to demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
- An ability to solve problems involving recurrence relations and generating functions.
- An ability to prove computational theorem

**Text Books:**

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. 4th edition2012.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd. 6th Edition 2008.
3. Deo N., Graph Theory, Prentice Hall of India.4th edition 2014.

**Reference Books:**

1. Trembley J.P. &Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.1st Indian Edition 2001.

| Subject Code | CS301 | Subject Title | ALGORITHMS: ANALYSIS & DESIGN | | | | | |
|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DC | Year | 3rd | Semester | V |

**OBJECTIVE:**

This course aims to provide the knowledge and understanding the complexity issues of algorithms

1. To introduce algorithms analysis and design techniques
2. To understand and design of algorithms used for searching, sorting, indexing operation

**Unit-I** **( 6 L)**

**Introduction**: Algorithms, Performance Analysis: Space and Time Complexity, Asymptotic Notations- Big Oh, Omega, theta notations, finding complexity of the algorithm, Linear Sorting: Insertion sort, Bubble sort, selection sort.

**Unit –II** **( 8 L)**

**Advanced Data structures:** B-Tree, Binomial Heaps, Fibonacci Heaps, Red & Black Tree.

**Divide and Conquer**: General method, binary search, quick sort, merge sort, heap sort,

**Unit –III** **( 8 L)**

**Greedy Method:** General method, Activity Selection, job scheduling with deadlines, fractional knapsack problem, Minimum cost spanning tree: Kruskal's and Prim's, single source shortest path, Huffman tree.

**Amortized analysis**

**Unit – IV** **( 8 L)**

**Dynamic Programming:** General Method, 0-1 Knapsack, Matrix chain multiplication, longest subsequence, all pair shortest paths,

**Backtracking**- Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

**Unit –V** **( 6 L)**

**Branch and Bound:** Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

**NP-Hard and NP-Complete problems:** Basic Concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes, Cooks Theorem.

**LEARNING OUTCOMES**

CO1. Analyzing complexity issues of algorithms

CO2. Ability in using the appropriate algorithm for searching, sorting, indexing operations

CO3. Designing of new algorithms

CO4. Student will be able to learn NP Class problems.

**Text Books:**

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
3. M.T.Goodrich and R.Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

**Reference Books:**

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw-Hill Education (Asia) ,2005
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, Pearson Education India; 1st edition 2002
3. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

| Subject Code | CS343 | Subject Title | Advanced Concepts in OOPs *(Departmental Elective 1/2 )* | | | | | |
|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | DE | Year | 3rd | Semester | V |

**OBJECTIVES:**

1. To understand the Object-based view of Systems
2. To develop robust object-based models for Systems
3. To inculcate necessary skills to handle complexity in software design.

**UNIT 1** **( 6 L)**

J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading.

J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures.

**UNIT 2** **( 8 L)**

JDBC: Introduction, JDBC Architecture, Types of JDBC Drivers, The Connectivity Model, The java.sql package, Navigating the Result Set object's contents, Manipulating records of a Result Set object through User Interface , The JDBC Exception classes, Database Connectivity, Data Manipulation (using Prepared Statements, Joins, Transactions, Stored Procedures).

**UNIT 3** **(8 L)**

Java Beans: The software component assembly model- The java beans development kit- developing beans JAR files-Introspection-Bound Properties-Persistence-customizers - java beans API. EJB: EJB architecture- EJB requirements –EJB session beans- EJB entity beans-EJB Clients.

**UNIT 4** **( 6 L)**

Java Servlet: Servlet overview, Brief origin and advantages over CGI, Writing small Servlet Programs, Deployment Descriptor, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet, Session: Definition, Different ways to track sessions.

**UNIT 5** **( 8 L)**

JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages-Sharing Session and Application Data. Accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

**LEARNING OUTCOMES**

After the completion of the course students will able to learn

CO1. Ability to analyze and model software specifications.

CO2. Ability to abstract object-based views for generic software systems.

CO3. Ability to deliver robust software components.

CO4. The student will be able to design projects using Advance concepts of OOPs.

**Text Book:**

1. J. McGovern, R. Adatia,Y. Fain, J2EE 1.4 Bible, Wiley-dream tech India Pvt. Ltd, New Delhi, 2003.
2. H. Schildt, 2002, Java 2 Complete Reference, 5th Edition, Tata McGraw-Hill, New Delhi.

**Reference Book:**

1. K. Moss, Java Servlets, Second edition, Tata McGraw Hill, New Delhi, 1999
2. D. R. Callaway, Inside Servlets, Addison Wesley, Boston, 1999.
3. Joseph O'Neil, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi, 1998.
4. Tom Valesky, Enterprise JavaBeans, Addison Wesley.
5. Cay S Horstmann & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley

| Subject Code | CS344 | Subject Title | Introduction to Cloud Technologies *(Departmental Elective 1/2 )* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **LTP** | 3 0 2 | **Credit** | 4 | **Subject Category** | DE | **Year** | 3rd | **Semester** | V |

**OBJECTIVES:**

The objective of this course is to study in-depth understanding of various aspects of cloud computing and be able to implement cloud services in an effective manner cloud Technologies.

Unit I ( 6 L)

**Overview of cloud computing** : What is a cloud, Definition of cloud , Definition of cloud ,characteristics of cloud ,Why use clouds, How clouds are changing , How clouds are changing , Driving factors towards cloud, Comparing grid with cloud and other computing systems, workload patterns for the cloud, "Big Data", IT as a service.

Unit II ( 8 L)

**Cloud computing concepts**: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services , Economies of scale, Management, tooling, and automation in cloud computing, Management: Desktops in the Cloud, Security.

Unit III (8 L)

**Cloud service delivery**: Cloud service , Cloud service model architectures, Infrastructure as a service (IaaS) architecture, Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS) , Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost to install versus ,Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.

Unit IV ( 6 L)

**Cloud deployment scenarios**: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.

Unit V ( 8 L)

**Cloud computing Security** : Cloud security reference model, How security gets integrated , Cloud security , Understanding security risks, Principal security dangers to cloud computing, Virtualization and multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches, Reducing cloud security, Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity, Encryption techniques, Encryption & Encrypting data , Symmetric key encryption, Asymmetric key encryption, Digital signature, What is SSL? IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

**LEARNING OUTCOMES**

At the end of course the students will able to learn:

CO1. Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures. Design different workflows according to requirements and apply map reduce programming model.

CO2. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO3. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds

CO4:.Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application .

**Text Book:**

1. R. Buyya, C. Vecchiola, S. T. Selvi, Matering Cloud Computing, Ed. Third reprint, 2013
2. B. Sosinsky, Cloud computing Bible, Ed. Reprint Willy India Pvt. Ltd, 2014,

**Reference Book:**

1. M. Miller, Cloud Computing, Pearson education in South Asia, Ed. 9th 2014.

**Humanities Electives II**

| Subject Code | HS384 | Subject Title | Principles of Management | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 2-0-0 | Credit | 2 | Subject Category | Elective | Year | III | Semester | V |

**Course Objective**

- The objective of this course is to familiarize B.Tech. Students with the roles, responsibilities, and skills required of modern managers.
- This course will be present the concepts of management as it applies to current thinking in the workplace.

**Unit 1 Overview of management** **5 Hrs.**

Definition-Management-Role of managers-Organization and the internal and environmental factors –Trends and Challenges of Management in India.
Directing – delegation –span of control– communication, Controlling

**Unit 2 Management Information** **4 Hrs.**

Introduction to functional areas of management, Operations management, Human resources management, Marketing management, Financial management

**Unit 3 Planning Approach to Organizational Analysis** **10 Hrs.**

Design of organization structure; job design and enrichment; job evaluation and merit rating

**Unit 4 Motivation and Productivity** **7 Hrs.**

Theories of motivation, Leadership styles and Managerial grid. Co-ordination, monitoring and control in organizations. Techniques of control; Few Cases on current management issues in India

**COURSE OUTCOME:**

- To present the topics in management, management theories, while at the same time focusing on practical applications in the real world especially for engineers.
- Evaluate the global context for taking managerial actions of planning, organizing and controlling.
- Assess global situation, including opportunities and threats that will impact management of an organization.
- Integrate management principles into management practices.

**TEXT BOOKS:**

1. Schermerhorn, Management and Organisational Behaviour essentials, Wiley India
2. Koontz: Essentials of Management, PHI Learning.
3. Hirschey: Managerial Economics, Cengage Learning.
4. A V Rau: Management Science, BSP, Hyderabad
5. Mote, l Paul and Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
6. Stephan R Robbins Fundamental of Management, Pearson

**REFERENCE BOOKS**

- Koontz, H., and Weihrich, H., Essentials of Management: An International Perspective, 8th ed., McGraw Hill, 2009.
- Hicks, Management: Concepts and Applications, Cengage Learning, 2007.
- Mahadevan, B., Operations Management, Theory and Practice, Pearson Education Asia, 2009
- Kotler, P., Keller, K.L, Koshy, A., and Jha, M., Marketing Management, 13th ed., 2009.
- Khan, M.Y., and Jain, P.K., Financial Management, Tata-Mcgraw Hill, 2008.

**Humanities Electives II**

| Subject Code | HS391 | Subject Title | Positive Psychology & Living | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 2-0-0 | Credit | 2 | Subject Category | Elective | Year | III | Semester | V |

**Course Objective**

- To increase awareness for relevance of positive emotions at workplace.
- To equip students with psychological skills to maximize happiness and virtues like compassion, love and wisdom through experiential, workshop based and interactive activities along with assigned lectures and reading

**Unit 1 What is positive psychology? 7Hrs.**

Introducing Positive Psychology: Definition, goals, assumptions, key concepts and relationships with health psychology, developmental psychology, social psychology and psychology of religion, Meaning and measure of Happiness: Hedonic and Eudemonic perspective, Yogic notion of bliss

**Unit 2 Positive Emotions, Cognitive states and Well-being 9Hrs.**

What are positive emotions? The broaden and build theory, relevance of positive emotional states for physical, social & psychological resources, Positive emotions and well-being: Happiness and positive behavior, positive emotions and success, resilience, Self-efficacy, Optimism, Hope, Wisdom, Mindfulness and flourishing

**Unit 3 How to enhance well-being? 5Hrs.**

Use of postures, breathing practices, Sounds, dietary consumption

**Unit 4 Positive Psychology at work place 5Hrs.**

Maximizing achievement, conflict resolution, gratitude, positive leadership

**COURSE OUTCOME:**

- Students learn about modern psychological knowledge of happiness.
- Students acquire skills to cultivate positive emotions.
- Measure and build individual, workplace and educational flourishing; plan, implement and assess positive psychology.
- Students will gain an understanding of what contributes to well-being and how to build the enabling conditions of a life worth living.

**TEXT BOOK:**

Snyder (2011). Positive Psychology: The Scientific and Practical Explorations of Human Strengths. New Delhi: Sage.

**REFERENCE BOOKS:**

1. Carr, A. (2004). Positive Psychology: The science of happiness and human strength.UK: Routledge.
2. Peterson, C. (2006). A Primer in Positive Psychology. New York: Oxford University Press.
3. Seligman, M.E.P. (2002). Authentic Happiness: Using the New Positive Psychology to Realize YourPotential for Lasting Fulfillment. New York: Free Press/Simon and Schuster.
4. Snyder, C.R., &Lopez,S.J.(2007). Positive psychology: The scientific and practical explorations of human strengths. Thousand Oaks, CA: Sage.
5. Snyder, C. R., & Lopez, S. (Eds.). (2002). Handbook of positive psychology. New York: Oxford University Press.

**Humanities Electives II**

| Subject Code | HS385 | Subject Title | Engineering Economics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 2-0-0 | Credit | 2 | Subject Category | Elective | Year | III | Semester | V |

**Course Objective:**

- To provide the basic overview of economics in engineering perspectives.
- To increase the understanding of students to solve the engineering problems through economic theories.
- To increase the understanding of students to use economics theories in project investment of industries

**Unit 1 General Overview of Economics 6Hrs.**

Nature and Scope of Economics in engineering perspective; **Theory of Demand Analysis:** Meaning and Types, Law of demand, Exceptions to the Law of Demand, Elasticity of Demand; **Theory of Supply Analysis:** Law of Supply and Elasticity of Supply; Mathematical Explanation on cost, revenue and profit function

**Unit 2 Production Function and Its Applications 6Hrs.**

**Production Function:**Short-run and long-run Production Function; **Mathematical Explanation:** Laws of Returns to Scale & Law of Diminishing Returns Scale; **Concept of Cost and Its Types:** Total cost, fixed cost, variable cost, average variable cost, average fixed cost, marginal cost, explicit and implicit cost; **Break-Even-Analysis:** Importance and graphical presentation, mathematical problems

**Unit 3 Time Value of Money and Project Evaluation 8Hrs.**

**Time Value of Money:** Simple and Compound, Uniform Series Compound Interest Formula, Present Worth Analysis, Future Worth Analysis, Future Value through Annuity, Rate of Return Analysis, Cash flow diagrams; **Depreciation**: Introduction, Straight Line and Declining Balance Method of Depreciation; **Project Evaluation Techniques:** Present Worth Method, Future Worth Method, Annual Worth Method; Benefit Cost Analysis: Conventional and Modified B/C Ratio with PW method

**Unit 4 Banking and Finance 6 Hrs.**

**Banking Sector:** Functions of the Commercial Bank and Central Bank, Financial Institutions; **Financial Market:** Money Market and Capital Market; **Monetary and Fiscal Policy:** Objectives, Instruments, Tools in Indian Economy; **Inflation:**Causes, Effects and Methods to Control it, Measurement of Inflation- Consumer Price Index and Whole Price Index; Deflation and Stagflation; **Business Cycles:** Various phases, Control and Measurement, Impact on business cycles on economic activities

**COURSE OUTCOME**

- Students will be able to apply economic principles and calculations to solve engineering projects.
- To students will be efficient to get the idea of production activities and its applications in industries.
- Students will be competent to estimate the present and future value of money on their various investment plans.
- Develop the ability to account for time value of money using engineering economy factors and formulas, as well as the implications and importance of considering taxes, depreciation, and inflation.

**TEXT BOOKS TEXT BOOKS**


1. Pravin Kumar (2015). Fundamental of Engineering Economics. Raj Kamal Press, New Delhi.
2. Riggs J.L., Dedworth, Bedworth D.B., and Randhawa, S.U. (1996). Engineering Economics. McGraw Hill International, New Delhi
3. PanneerSelvam R. (2001). Engineering Economics. Prentice Hall of India Ltd, New Delhi.


**REFERENCE BOOK**


- L.M. Bhole (2007). Financial Institutions and Markets. Tata McGraw Hill, New Delhi.

**Humanities Electives II**

| Subject Code | HS382 | Subject Title | Literature, Language & Society | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 2-0-0 | Credit | 2 | Subject Category | Elective | Year | III | Semester | V |

**Course Objective**

- The focus of the programme is on the interaction between literature & Society, and Literature and visual culture
- To discuss how Literature reacts to major changes in society

**Unit 1** **4Hrs.**

Nature and Functions of Literature, Literature and Society with special reference to Indian Literature and Indian Society, Literary Forms, Poetry, Drama, Fiction, Essay, Autobiography

**Unit 2** **7Hrs.**

Approaches to the Study of Literature, Reader response to the study of Literature, Interpretation, Appreciation, Evaluation, Special problems in understanding Modern Literature.

**Unit 3** **9Hrs.**

Social dimension of language. problems of multilingual communities, dominance and conflict, shift and attrition, language and the state, language and nation, Indian multilingualism, language variation, language and identity, linguistic prejudice and inequality, standardization, linguistic determinism, critical discourse analysis, and methodological issues.

**Unit 4 TEXT** **6 Hrs.**

Jerome K Jerome: Three Men on a Bummel (selection), Martin Amis: Last Days of Muhammad Atta, Li Ho: A Girl Comb her hair, R.K. Narayan: Malgudi Days (selection)

**COURSE OUTCOME**

- Students will read critically from a variety of genres, specifically poetry, drama, non fiction, and fiction.
- Students will read literature more carefully and meaningfully, practicing close-reading skills.
- Students will understand the relation between historical and cultural contexts.
- The students will develop a critical understanding of how literature can both uphold and resist existing structures of power.

**TEXT BOOKS**

1. Jerome K Jerome: Three Men on a Bummel (selection), Arrow smith Publications
2. R.K. Narayan: Malgudi Days (selection), I*ndian Thought Publications*

**REFERENCE BOOKS**

- Martin Montgomery, An Introduction to Language and Society (Studies in Culture and Communication)Routledge; 2 edition (December 22, 1995)
- Robe Pope, *An Introduction to Language Literature and Culture*.Routledge, 2005

# Syllabus of B.Tech – Electrical Engineering

| Subject Code | HS301 | Subject Title | APTITUDE & SOFT SKILLS III | | | | | |
|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 0 | Credit | 0 | Subject Category | AC | Year | III | Semester | V |

**Course Outline:** The first step of an intensive two step placement training module equips the students to successfully handle the placement program of any on-campus/off-campus company. It not only provides career guidance about the selection process but also helps students in profile building; self-introduction and proactive internship search techniques.

**Course Objective:**

1. Interpret the questions of aptitude building objectively and prepare for various competitive examinations
2. Understand the optimized approach of dealing with placement questions
3. Learn ways of representing themselves effectively in formal settings

**Course Pre / Co-requisite (if any)**: Understanding of writing concepts, general intelligence of LR, algebra concepts and equation formation, time management and presentation skills covered in Aptitude and Soft Skills I and II.

**Detailed Syllabus**

**UNIT 1 - QUANTITATIVE APTITUDE 11 HOURS**

**Number System 03 hours**

Types of numbers; Factors; Divisibility test; Place and face Value; Base system; Remainder theorem; digits at the unit places and finding last two digits in a given expression; Calculating number of zeroes, Finding maximum power of any prime number or any composite number in any factorial, HCF and LCM.

Fractions–Types of fractions; Conversion of terminating and non-terminating types of decimal into fraction; Subtraction, addition and multiplication of terminating and non-terminating decimals.

**Percentage 02 hours**

Basic concepts; Conversion from fraction to percentage; Application of percentage in – Expenditure, Cost, Consumption problems; Population increase or decrease problems; Production, Manpower and Working hour problems; successive increment or decrement; Comparison of salary or numbers; Percentage change in area or volume, etc.

**Ratio and Proportion 02 hours**

Ratio, Proportion and Variation: Ratio- Introduction; Types of ratios; Comparison of Ratios; Concept of duplicate, triplicate, sub-duplicate and sub-triplicate ratios.

Proportion and variation – Concept of direct, inverse, continuous and mean proportions.

**Profit and Loss 02 hours**

Introduction; Concept of single, double and triple discount and marked price.

**Simple / Compound Interest 02 hours**

Simple Interest and compound Interest: Basic concept of Principal, Time, Amount and Rate of Interest; Concept of Lent money.

**UNIT 2- VERBAL APTITUDE 09 HOURS**

**Tenses 02 hours**

Understanding and aligning them with the various question types.

**Subject – Verb Agreement 02 hours**

Subject-Verb Agreement: Rules and Applications; commonly confused words-II; Gerunds, Active and Passive voice.

**Question Types 03 hours** Introduction to Question types-I: Fill in the blanks, One word Substitution, Spellings, understanding the right word choice, concept of para jumbles and para completion, reading comprehension, verbal analogies, odd man out, phrases and idioms.

Introduction to Question types-II: Error identification, Homophones, Usage of the various figures of speech, commonly confused words and phrases, techniques for tackling synonyms and antonyms.

**Reading Comprehensions** **02 hours** Reading Comprehension: Basics of Comprehensions, different tones of comprehensions, cracking question types like contextual vocabulary, fill in the blanks, true/false questions, reference to context, summary and title of the passage, paraphrasing the text.

**UNIT 3- LOGICAL REASONING 10 HOURS**

**Coding Decoding and Sequences** **02 hours**
Coding Decoding, Cryptarithmetic, Sequence and Series - Finding the missing term/wrong term in the logical sequence of letter/number/word/alphanumeric, Continuous pattern series.

**Verbal Analogies and Odd man out** **02 hours**
Verbal Analogy based on various parameters - Antonym / synonym relationship, Quantity and unit, Individual and Group, Product and Raw material, cause and Effect etc.
Odd man out based on several kind of relationship – Relationship based on meaning, functional relationship, even- odd or prime-composite, divisibility rule, etc.
**Blood Relation and Direction Sense** **02 hours** Blood Relation-Indicating form / puzzle form / coding form, Direction Sense, Direction puzzles.

**Seating Arrangements** **02 hours** Seating Arrangements – Linear / Circular / Distribution / comparison/ Floor and box arrangement /Quant based arrangements/ etc.

**Critical Reasoning– I** **02 hours**
Statement and assumptions, course of action, statement and conclusion, probably true/false.

**UNIT 4- NON VERBAL COMMUNICATION 04 HOURS**

Types of Non Verbal Communication, Body Language-Exercises and Activities, Error Analysis & Feedback Sharing.
**Suggested Activities & Exercises**: (i) Communication Origami, (ii) Power of body language, (iii) Draw it.

**UNIT 5- ONLINE PROFILING & SOCIAL MEDIA ETHICS 05 HOURS**

Social Media ethics and etiquette, Do's & Don'ts, LinkedIn Profile Development, Example Sharing, Feedback Sharing & Error Analysis.
**Suggested Activities & Exercises:** (i) Online Portfolio Creation, (ii) Fun Social Media Projects,
(iii) LinkedIn profile development project with feedback sharing and error analysis

**LEARNING OUTCOME:**

By the end of this semester, students will be able to perceive and analyse the requirements of placement trends as detailed information about the selection process would be provided by career guidance. They will be more confident and will be able to develop a professional profile, both online and offline.

**Text book [TB]:**

1. Quantitative Ability: How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition-2018.
2. Logical Reasoning**:** A Modern Approach to Logical Reasoning-R.S. Aggarwal S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018.
4. Soft Skills: The Definitive Book of Body Language by Barbara and Allan Pease; RHUS; 1 edition-2006.

**Reference books [RB]:**


1. QA : Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2017.
   QA: Quantitative Aptitude- Saurabh Rawat and Anushree Sah Rawat, Savera Publishing House, 1st Edition-2016.
2. LR: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha, Pearson India; 5th edition-2016.
   LR: Wiley's Verbal Ability and Reasoning - P A ANAND,Wiley-2016.
3. VA : Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
   VA: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996
4. Soft Skills :How to Talk to Anyone by Leil Lowndes Harper Element; New edition-2015.
   Soft Skills: Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler; Brilliance Audio; Abridged, Updated edition-2013.