UG OPEN ELECTIVES-I 2016 BATCH ONWARDS		
Internal	External	Total
40	60	100

NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON

UG OPEN ELECTIVES-I 2016 BATCH ONWARDS		
COURSE CODE	**COURSE**	**NOT APPLICABLE FOR PROGRAMMES**
BFOT0-F91	Plant Utilities & Control	B. Tech. Food Technology
BBAD0-F91	Fundamentals of Management	BBA
BBAD0-F92	Personnel & Industrial Management	
BBAD0-F93	Corporate Governance & Ethics	
BBAD0-F97	Introduction to Entrepreneurship and Marketing	
BECE0-F91	Optical Communication	B. Tech. Electronics & Comm. Engg., B. Tech. Electronics & Telecomm. Engg., B. Tech. Electronics & Instrumentation Engg.
BECE0-F92	Cellular and Mobile Communication	
BECE0-F93	Biomedical Electronics and Instrumentation	
BEEE0-F91	Power Plant Engineering	EEE
BEEE0-F92	Analog & Digital Circuit Analysis	
BEEE0-F93	Digital Signal Processing	
BMEE0-F91	Industrial Safety and Environment	B. Tech. Mechanical Engg.
BMEE0-F92	Refrigeration and Air Conditioning	
BCIE0-F91	Environmental Pollution	B. Tech. Civil Engg.
BCIE0-F92	Traffic Engineering	
BCIE0-F93	Soil Mechanics	
BCIE0-F94	Design of Steel Structures	
BELE0-F91	Elements of Power Plants	B. Tech. Electrical Engg.
BELE0-F92	Basics of Instrumentation Engineering	
BELE0-F93	Substation Equipment	
BMAT0-F91	Numerical Analysis	B.Sc. (Hons. School) in Maths
BCIE0-F91	Environmental Technology & Safety	Petrochemical & Petroleum Refinery Engg.
BCSE0-F92	Object Oriented Programming Using C++	B. Tech. CSE
BCSE0-F93	Essential of IT	

PLANT UTILITIES & CONTROL

Subject Code: BFOT0-F91 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

UNIT-I

Properties of Steam: Introduction – steam formation – Thermodynamic properties of steam – Sensible heat, latent heat, dryness fraction, wet fraction – superheated steam – steam table, expansion of steam

Steam Generators: Introduction, Classification & Boilers, Water tube, Fire tube type, Vertical tabular boilers, types of fire and water tube boilers, boiler mounting & accessories, Performance of steam generator, Evaporation rate. Performance, boiler efficiency, Factors influencing Boiler efficiency problems.

UNIT-II

Fuels & Combustion: Introduction, solid, liquid & gaseous fuel, Calorific value of fuel, flue gases per kg. of fuel, Minimum Air required per kg. of fuel, Excess Air Problems.

Condensers The function of a condenser in a Steam Power Plant, Vacuum, Classification, Comparison of Jet & Surface Condensers, Advantages/Disadvantages Mass of Circulating Water required in a condenser, Air Removal.

Fitting, Safety &Maintenance: Selection of size of steam pipes – layout of pipe lines – Energy audit of steamboilers – economy of heat utilization – boiler codes – Indian boiler regulation act – safety in steam plant maintenance

UNIT-III

Gears: Introduction, Classification of Gears, Parallel Shafts, Spur Gears Spur Rack & Pinion, Helical Gears, Intersecting Shafts, Straight Bevel Gears, Spiral Bevel Gears, Skew Shafts, Crossed Helical Gears, Worm Gear, Hypoid Gears, Gear Terminology, Pitch Circle, Pitch dia, Pitch, Circular Pitch.

UNIT-IV

Lubrication: Introduction, Physical & Chemical Test of Lubricants, Methods of Applying Lubrication, Hand oiling, drop feed cup, ring type of lubrication etc.

Corrosion: Corrosion & its control, General Corrosion, Localized Corrosion, Pitting Corrosion etc. Factors influencing Corrosion, Combating Corrosion, Selection of material.

Recommended Books:

1. Antonio López-Gómez Gustavo V. Barbosa-Cánovas, ‘Food Plant Design’, CRC Press, Boca Raton, **2005**.
2. C.P. Mallet, ‘Frozen Food Technology’, Blackie Academic & Professional an imprint of Chapman & Hall, **1993**.
3. J. Lal & Prof. J.M. Shah, ‘Theory of Machine’, Publishers Metropolitan Book & Co. Pvt. Ltd, Delhi-6.
4. S.S. Rattan, ‘Theory of Machine’, Tata McGraw Hill Publishing Co. Ltd, New Delhi, **2009**.
5. P.L. Ballaney, ‘Thermal Engineering’, Khanna Publishers, New Delhi, **1995**.

FUNDAMENTALS OF MANAGEMENT

Subject Code: BBAD0-F91 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Learning Objectives: This course aims to provide a thorough and systematic coverage of management theory and practice. The course aims at providing fundamental knowledge and exposure of the concepts, theories and practices in the field of management. It focuses on the basic roles, skills and functions of management, with special attention to managerial responsibility for effective and efficient achievement of goals.

UNIT-I (10 Hrs.)

Introduction to Management: Definition, Nature, Significance and Scope. Functions of Manager, An Overview of Management Functions. Is managing a science or art? Evolution of Management Thought: Classical Approach, Scientific Management

UNIT-II (10 Hrs.)

Planning and Decision Making: Types of Plans and Process of Planning, Nature of Objectives, Setting Objectives. Importance and Steps in Decision Making, Types of Decision and Decision Making Under Different Conditions. Group Decision Making. Decision Making Styles

Organizing: Nature and Significance, Process of Organizing, Bases of Departmentation, Delegation and Decentralization, Line & Staff relationship

UNIT-III (10 Hrs.)

Delegation: Concept and Elements. Authority, Responsibility, Accountability

Coordination: Concept and Importance, Factors which Make Coordination Difficult, Techniques or Methods to Ensure Effective Coordination.

UNIT-IV (10 Hrs.)

Control: Concept, Planning-Control Relationship, Process of Control, Traditional & Modern Techniques of Control

Management by Objectives: Concept, Benefits and Weaknesses

Course Outcomes: After completing the course student will be able to understand and explain the concept of management and its managerial perspective. It will equip students to map complex managerial aspect arise due to ground realities of an organization. They will Gain knowledge of contemporary issues in Management principles and various approaches to resolve those issues.

Recommended Books:

1. Heinz Weihrich, Cannice& Koontz, 'Management (A Global Perspective)', Tata McGraw Hill.
2. Harold Koontz, and Heinz Weihrich, 'Essentials of Management: An international Perspective', Tata McGraw Hill.
3. Stephen Robbins & Mary coulter, 'Management', Pearson Education.
4. VSP Rao & VH Krishna, 'Managemen't', Excel Books.
5. P. Subba Rao, 'Principles of Management', Himalaya Publishing.

PERSONNEL & INDUSTRIAL MANAGEMENT

Subject Code: BBAD0-F92 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting look for any organization today.

UNIT-I (10 Hrs.)

Human Resources Management: Meaning, Scope, Objective, Functions, Roles and Importance. Interaction with other functional areas. HRM & HRD a comparative analysis, Human Resource Planning: Meaning, Process & Methods of Human Resources Planning,Job Analysis: Job Description, Job Specification.

UNIT-II (10 Hrs.)

Recruitment & Selection: Concept, Process & Methods. Concept of Induction & Placement, Training & Development: Concept & Methods, Difference Between Training & Development, Internal Mobility: Promotion, Transfer, Demotion, Separation.

UNIT-III (10 Hrs.)

Performance Appraisal: Concept, methods & Process. Compensation Management- Wage & Salary Administration, Elements & Methods of Wage & Salary, Incentive Plans & Fringe Benefits

UNIT IV (10 Hrs.)

Industrial Relations: Meaning and importance. Collective Bargaining, Participative Management, Employee Grievances and their Resolution, Quality Circles.

Course Outcome: After completing this course the students should be able to understand the concepts, principles and processes of HRM, understand the crucial role that HRM plays in helping organizations all over the world adapt to the endless change today.

Recommended Books:

1. Edwin B.Flippo, 'Personal Management', Tata McGraw Hill.
2. Bohlander, Snell &Vohra, 'Human Resource Management', Cengage Learning.
3. Gary Dessler, Human Resource Management, McMillan.
4. V.S.P.Rao, 'Human Resource Management', Excel Books.
5. C.B. Mamoria, 'Personal Management', Himalaya Publications.
6. T.N. Chabbra, 'Human Resource Management', Dhanpat Rai & Sons.
7. C.B. Gupta, 'Human Resource Management', Sultan Chand and Sons.
8. R.S. Dwivedi, 'HRD in India Companies', Himalaya Publications.

CORPORATE GOVERNANCE & ETHICS

Subject Code: BBAD0-F93 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

UNIT-I (10 Hrs.)

Introduction to Ethics and Values and their importance in business: Ethical issues in Capitalism and Market System, Ethical and Social System. The Social Responsibility of Business, Ethical Conflict, Whistle Blowing.

UNIT-II (10 Hrs.)

Ethics and Organization, Ethics in Human Resource Management and Organizational Culture, Ethics in Marketing, Ethics in Finance, Ethical Codes and Incentives in Corporate Sector.

UNIT-III (10 Hrs.)

Broader Ethical issues in Society – Corruption, Ecological Concern, Discrimination on the Basis of Gender, Caste or Race, Ethics and Information Technology.

UNIT-IV (10 Hrs.)

Impact of Group Policies and Laws of Ethics, Resolving Ethical dilemma.

Corporate Governance: Issues, Need, Transparency & Disclosure, Role of Auditors, Board of Directors and Shareholders, Corporate Social Responsibility.

Recommended Books:

1. R.C. Shekhar, 'Ethical Choices in Business', Response Book, New Delhi.
2. S.C. Chakraborty, 'Managerial Transformation by Value', Sage Publications, New Delhi,**1993.**
3. Ananta K. Giri, 'Values, Ethics and Business: Challenges for Education and Management', Rawat Publication, Jaipur.

INTRODUCTION TO ENTREPRENEURSHIP AND MARKETING

Subject Code: BBAD-F97 **L T P C** **Duration: 42 Hrs.**
3 0 0 3

Course Objectives:

This course provides business and non-business majors with the skills necessary to succeed as an entrepreneur. The fundamentals of starting and operating a business, developing a business plan, obtaining financing, marketing a product or service and developing an effective accounting system will be covered.

Course Outcomes:

The student will be able to demonstrate knowledge of the following topics:

1. Understanding the dynamic role of entrepreneurship and small businesses.
2. Organizing and Managing a Small Business.
3. Financial Planning and Control.
4. Forms of Ownership for Small Business.

Unit - I (10 Hrs.)

Entrepreneurship Development- Assessing overall business environment in the Indian economy, Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs.

Unit - II (12 Hrs.)

Globalization and the emerging business/entrepreneurial environment, Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; Motivation and entrepreneurship development, importance of planning, monitoring, evaluation and follow up.

Unit - III (10 Hrs.)

Managing competition: entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations; Government schemes and incentives for promotion of entrepreneurship.

Unit - IV (10 Hrs.)

Government policy on Small and Medium Enterprises (SMEs) / SSIs, Export and Import Policies relevant to horticulture sector, Venture capital; Contract farming and joint ventures, public-

private partnerships, Characteristics of Indian farm machinery industry, Social Responsibility of Business.

Recommended Books& References

1. Morgan, A. Kallianpur, and L.M. Lodish, 'Entrepreneurial Marketing', Lessons from Wharton's Pioneering MBA Course, John Wiley & Sons Publisher, **2001**.
2. D.A. Aaker, 'Strategic Market Management', John Wiley & Sons Publisher,**1998.**

OPTICAL COMMUNICATION

Subject Code: BECE0-F91 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Learning Objectives:

1. To facilitate the knowledge about optical fiber sources and transmission techniques
2. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical
3. CDMA.
4. To explore the trends of optical fiber measurement systems.

Learning Outcomes:

Upon completion of the Course, students will be able to:

1. Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
2. Explain the various optical sources and optical detectors and their use in the optical communication system.
3. Analyze the digital transmission and its associated parameters on system performance.

UNIT-I

Overview: The Electromagnetic Spectrum, Properties of Light, Dual Nature of Light Concept of a photon, Wave Model, Characteristics of light waves. Concepts of information, general communication systems, evolution of Basic fiber Optic Communication System, Benefits and disadvantages of fiber Optics. Transmission Windows. Transmission Through Optical fiber, The Laws of Reflection and Refraction, Light rays and light waves, Reflection of light from optical surfaces, Refraction of light from optical interfaces, Numerical Aperture (NA).

UNIT-II

Losses in Optical Fiber: Attenuation, Material absorption losses, linear and nonlinear scattering losses, fiber bend loss, dispersion viz. inter modal dispersion and intra modal dispersion, overall fiber dispersion and polarization, attenuation and dispersion limits in fibers, self-phase modulation, combined effect of dispersion and self-phase modulation.

Fiber Material, Couplers and Connectors: Preparation of optical fiber: liquid-phase techniques, vapor phase deposition techniques, Connector Principles, fiber End Preparation, splices, connectors.

UNIT-III

Optical Sources and Detectors: Sources: Basic principle of surface emitter LED and edge emitter LED- material used, structure, internal quantum efficiency and characteristics, LASER Diode - material used, structure, internal quantum efficiency and characteristics, working Principle and characteristics of Distributed feedback (DFB) laser. Detectors: PIN photodiode - material used, working principle & characteristics, Avalanche Photodiode: - material used, working principle and characteristics

UNIT-IV

Advanced Topics: Optical TDM, SCM, WDM and Hybrid multiplexing methods, Fiber Optic Networks, Trans-receivers for Fiber-Optic Networks, Semiconductor Optical Amplifiers, Erbium Doped Fiber Amplifiers (EDFAs).
Optical Networks: Elements and Architecture of Fiber-Optic Network, SONET/SDH, ATM, IP, Optical Line Terminals (OLT), Optical Add-Drop Multiplexers, Optical Cross Connects.
Recommended Books:

1. John M.Senior, 'Optical Fiber Communication Principles & Practice', PHI Publication.
2. John Gowar, 'Optical Communication Systems', PHI Publications.
3. Gerd Keiser, 'Optical Fiber Communication', McGraw Hill International Publications.
4. BishnuP.Pal, 'Fundamentals of Fibre Optics in Telecommunication and Sensor Systems', NewAge International (P) Ltd.
5. Rajiv Ramaswami, Kumar N. Sivarajan, 'Optical Networks Practical Perspective', Elsevier.

CELLULAR AND MOBILE COMMUNICATION

Subject Code: BECE0-F92 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Learning Objectives:
The student should be made to:
1. Know the characteristic of cellular mobile systems
2. Learn the various elements of cellular radio systems design and interference
3. Understand the concepts behind various digital signaling schemes for fading channels
4. Be familiar the various multipath mitigation techniques.
5. Understand the various handoff techniques.

Learning Outcomes:
At the end of the Course, the student should be able to
1. Understand cellular wireless communication systems.
2. Learn about elements of cellular radio systems.
3. Compare multipath mitigation techniques and analyze their performance.
4. Describe about hand offs and call drops.

UNIT-I

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, Uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.
Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface - specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features, 3G systems: UMTS & CDMA 2000 standards and specifications.

UNIT-II

Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.
Interference: Introduction to co-channel interference, real time co-channel interference, cochannel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

UNIT-III

Cell Coverage for Signal & Traffic: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.
Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.

UNIT-IV

Hand Off, Dropped Calls: Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.
Operational Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.
Recommended Books:
1. C.Y. Lee William,'Mobile Cellular Telecommunications', McGraw Hill.
2. KamiloFeher, 'Wireless and Digital Communications', PHI.
3. T.S. Rappaport, 'Wireless Communication, Principles & Practice', PHI.

BIOMEDICAL ELECTRONICS AND INSTRUMENTATION

Subject Code: BECE0-F93 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Learning Objectives:
This Course introduces general biological concepts
1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Learning Outcomes:
Upon successful completion of the Course, students will be able to
1. Use bioinstrumentation, required in cellular or molecular biology investigations
2. Apply the concepts of engineering in different streams of biomedical field.

UNIT-I

Biomedical Signals: Origins of Bioelectric Signals, Human body, Heart and Circulatory System, Electrodes, Transducers, ECG, EMG.

UNIT-II

Recording & Monitoring Instruments: Recording Electrodes, Physiological Transducers, Biomedical Recorders, Biomedical Recorders, Heart rate measurement, Temperature measurement, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Biomedical Telemetry.

UNIT-III

Imaging System: Working with X-Rays, CT scanner, NMR, NMR, Ultrasonic System, Ultrasonic System, Ultrasonic System.

UNIT-IV

Therapeutic & Physiotherapy Equipment's: Cardiac Pacemakers, Cardiac defibrillator, SW Diathermy & MW Diathermy.
Patient Safety: Electric Shock Hazards, Test Instruments, Biomedical Equipment's, Biomedical Equipment's.
Recommended Books:

1. R.S. Khandpur, 'Handbook of Biomedical Instrumentation'.
2. Leslie Cromwell, 'Biomedical Instrumentation and Measurements', PHI.
3. T.K. Attuwood, 'Introduction to bioinformatics', Pearson Education.
4. Joseph J. Carr& John M Brown, 'Introduction to biomedical equipment Technology', PearsonEducation.

POWER PLANT ENGINEERING

Subject Code: BEEE0-F91 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Learning Objectives:

1. Describe sources of energy and types of power plants.
2. List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems.
3. Define the performance characteristics and components of such power plants.
4. List different types of fuels used in power plants and estimate their heating values.
5. List the principal components and types of nuclear reactors.

Learning Outcomes:

Students successfully completing this module will be able to:

1. Students will be adequately trained to become Power Plant Engineers,
2. Students will be skilled theoretically and practically design of various power plant, operation, maintenance and repairing works,
3. Students will be substantially prepared to take up prospective research assignments.

UNIT-I (09 Hrs.)

Generators, Boilers, Turbines and Condensers: Classification of steam generators, Types of Boilers: Babcock Wilcox, Cochran boilers, Types of condensers, effect of air in condensers, Dalton's law of partial pressure, cooling water calculations, steam nozzles, types of steam turbines, efficiencies, compounding, governing and control.

Combined Power Cycles– Comparison and Selection, Load Duration Curves.

Steam Boilers and Cycles–High Pressure and Super Critical Boilers–Fluidized Bed Boilers

UNIT-II (10 Hrs.)

Thermal Power Plant: Layout of Thermal Power Plant, selection of site, Description of Rankin cycle, Regenerative cycle, Reheat-Regenerative Cycle, Binary Vapour Cycle, High Pressure and Super Critical Boilers. Different systems of thermal power plant: fuel, air and flue gas systems, pulverizes, Condensate and feed water system, Construction and functioning of condenser, de-aerator and closed feed water heaters, HP - LP By-pass systems, Auxiliary Steam System, Turbine gland steam system. Cooling water system, Cooling Towers—principle of operation and types, Ash handling, electrostatic precipitators, Advantages and Disadvantages of Thermal Power Plants.

UNIT- III (10 Hrs.)

Hydro-Electric Power Plants: Layout of Hydro Power Plant, selection of site, classification of Hydro power plants, Essential Elements, Hydrology, Hydraulic Turbines, Governing of Turbines-Micro Hydel developments, Calculation of available Hydro Power, Combined operation of Hydro and Thermal Power Plants, Advantages and Disadvantages of Hydro Power Plants.

Nuclear Power Plants: Energy– Fission, Fusion Reaction, Components of Nuclear Power Plant, selection of site, Layout of Nuclear Power Plant, Types and classification of Reactors, Pressurized Water Reactor (PWR), Boiling Water Reactor (BWR), Waste Disposal and safety, Advantages and Disadvantages of Nuclear Power Plants.

UNIT-IV (07 Hrs.)

Diesel and Gas Turbine Power Plant: Diesel power plant- Layout, Selection of site, Types of Diesel Plants, Components, Diesel Cycle, Engine Types.

Gas Power Plant- Layout, Gas Turbine cycle, Fundamental concept of gas turbine control and monitoring system, Applications of Gas Turbine Power Plant–Fuels- Gas Turbine Material–Open, Closed Cycles and Combined Cycle, Efficiency, Advantages and Disadvantages of diesel and gas turbine power plant

Recommended Books:

1. EI-Wakil M.M., 'Power Plant Technology', McGraw Hill,**1984**.
2. S.C. Arora, 'A course in Power Plant Engineering',Dhanpat Rai & Sons.
3. P.K. Nag, 'Power Plant Engineering', Tata McGraw Hill, **1998.**
4. G.R. Nagpal,'Power Plant Engineering', Hanna Publishers, **1998.**
5. K.K.Ramalingam, 'Power Plant Engineering', Scitech Publications, **2002.**
6. G.D.Rai,'Introduction to Power Plant Technology', Khanna Publishers, **1995.**
7. R.K. Rajput, 'Power Plant Engineering', Laxmi Publications, **1995.**

ANALOG AND DIGITAL CIRCUIT ANALYSIS

Subject Code: BEEE0-F92 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Learning Objectives:

1. To provide concepts that underpins the disciplines of Analog circuits, digital electronics.
2. To provide the concept of various components.
3. To provide basic knowledge of designing Analog and digital circuits.

Learning Outcomes:

1. Knowledge and awareness of various components their design and characteristics.
2. To know about the various operational amplifiers and linear applications
3. Number systems and codes, boolean algebra and logic gates, combinational logic design calculations and conversions.

UNIT- I (08 Hrs.)

Voltage Regulator and Components: Zener diode. Series and Shunt Regulator. Regulator ICs 78XX, IC 79XX.Light Emitting diode(LED), Schottky diode, Varactor diode, Photodiodes, Liquid crystal Displays, Solar cells, Thermistor.

Biasing of BJT: DC operating point, BJT characteristics & parameters, all biasing circuits, Differential Amplifier, Introduction to FET and comparison with BJT.

UNIT- II (10 Hrs.)

Operational Amplifiers and Linear Applications: Block diagram representation, Ideal Op-amp, Op-amp with negative feedback, Op-amp IC 741 specifications. Basic op-amp applications: Adder, Scalar, Subtractor, Difference amplifier, I-V converter, V-I converters, Integrator, Differentiator, IC 555 Timer, Astable and Monostable Multivibrator.

UNIT- III (12 Hrs.)

Number Systems and Codes: Binary, Octal, Decimal and Hexadecimal Number Systems and their conversion, Binary Addition and Subtraction, Gray Code, BCD Code, Excess-3 code, ASCII Code.Boolean Algebra and Logic Gates: Theorems and Properties of Boolean Algebra, Standard SOP and POS form, Reduction of Boolean functions using Algebraic method, K -map method (2,3,4 Variable). Basic Digital Circuits: NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR Gates.

Combinational Logic Design: Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder, one digit BCD Adder, code conversion, Multiplexers and Demultiplexer, Decoders, 4-bit Magnitude Comparator IC 7485 and ALU IC74181.

UNIT- IV (06 Hrs.)

Sequential Logic Design: Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion, Shift Registers, Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter, Ring and Johnson Counter.

Recommended Books:

1. J. B. Gupta, 'Electronics Devices & Circuits', S.K. Kataria& Sons.
2. A. Rajkumar, 'A Textbook on Analog Circuits', Made Easy Publication.
3. I.J. Nagrath, 'Electronics: Analog and Digital', Prentice Hall India Learning Private Limited.
4. Sanjay Sharma, 'Analog and Digital Electronics' S.K. Kataria & Sons.
5. Ramakant A. Gayakwad, 'Op-Amp and Linear Integrated Circuits', Pearson Education.

DIGITAL SIGNAL PROCESSING

Subject Code: BEEE0-F93 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Learning Objectives:

1. To learn discrete Fourier transform and its properties.
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite. impulse response filters for filtering undesired signals.
3. To understand Finite word length effects.

Learning Outcomes:

Upon completion of the course, students will be able to

1. Apply DFT for the analysis of digital signals & systems
2. Design IIR and FIR filters
3. Characterize finite Word length effect on filters
4. Study the concept of Multirate and adaptive filters

UNIT-I (08 Hrs.)

Introduction: Signals, Systems and Signal Processing, Classification of Signals, Concept of Frequency in Continuous Time and Discrete Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Applications of Signal Processing.

Discrete Time signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time-Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time systems, Correlation of Discrete Time Signals.

UNIT-II (10 Hrs.)

The Z-transform and its Application to the Analysis of LTI Systems: The z-Transform, Properties of z-Transforms, Inversion of z-Transform, One-sided z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Frequency Analysis of Signals and Systems: Frequency Analysis of Continuous –Time Signals, Frequency Analysis of Discrete Time Signals, Properties of Fourier Transform for Discrete Time Signals. Frequency Domain Characteristics of Linear Time-Invariant Systems, Linear Time-Invariant Systems as Frequency-Selective Filters, Inverse Systems and Deconvolution.

UNIT-III (09 Hrs.)

The Discrete Fourier Transform: its properties and applications: Frequency Domain Sampling: The discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods based on the DFT. Frequency Analysis of Signals Using the DFT.

Efficient computation of DFT: Fast Fourier transforms: Efficient Computation of DFT: FFT Algorithms, Application of FFT Algorithms, A Linear Filtering Approach to Computation of DFT. Quantization Effect in the Computation of DFT.

UNIT-IV (09 Hrs.)

Implementation of Discrete Time Systems: Structures for the realization of Discrete Time Systems, Structures for FIR Systems, Structures for IIR Systems, Representation of Numbers, Quantization of Filter Coefficients, Round off Effect in Digital Filters.

Design of Digital Filters: General Considerations like causality etc., Design of FIR Filters, Design of IIR Filters from Analog Filters, Frequency Transformations, Design of Digital Filters Based on Linear Squares Method.

Sampling and Reconstruction of Signals: Sampling of Bandpass Signals, Analog-to-Digital Conversion, Digital-to-Analog Conversion.

Recommended Books:

1. J.G Proakis and D.G. Manolakis, 'Digital Signal Processing: Principles, Algorithms and Application',Pearson Prentice Hall.
2. S.K. Mitra, 'Digital Signal Processing: A Computer Based Approach', TMH.
3. V. Oppenheim, R. W. Schafer and J. R. Buck, 'Discrete-time Signal Processing', PHI.
4. Widrow and S.D. Stearns, 'Adaptive Signal Processing', Prentice Hall.

INDUSTRIAL SAFETY AND ENVIOREMENT

Subject Code: BMEE0 –F91 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

UNIT-I

Meaning & Need for Safety: Relationship of safety with plant design, equipment design and work environment. Industrial accidents, their nature, types and causes. Assessment of accident costs; prevention of accidents. Industrial hazards, Hazard identification techniques, Accident investigation, reporting and analysis.

UNIT-II

Planning for Safety & its Measures: Definition, purpose, nature, scope and procedure. Range of planning, variety of plans. Policy formulation and implementation of safety policies. Safety

measures in a manufacturing organization, safety and economics, safety and productivity. Employees participation in safety. Safety standards and legislation.

UNIT-III

Meaning of Environment and Need for Environmental Control: Environmental factors in industry. Effect of temperature, Illumination, humidity noise and vibrations on human body and mind. Measurement and mitigation of physical and mental "fatigue" Basics of environment design for improved efficiency and accuracy at work. Environment Standards: Introduction to ISO 14000; Environment standards for representative industries.

UNIT-IV

Ventilation and Heat Control Purpose of ventilation, Lighting, Noise & Vibrations: Physiology of heat regulation. Thermal environment and its measurement. Thermal comfort. Indices of heat stress. Thermal limits for comfort, efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning Process ventilation. Control of heat exposures: control at source, insulation, and local exhaust ventilation. Control of radiant heat, dilution ventilation. Local relief. Industrial Lighting: Purpose of lighting, benefits of good illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Design of lighting installation. Maintenance standards relating to lighting and colour. Noise & Vibrations: Continuous and impulse noise. The effect of noise on man. Noise measurement and evaluation of noise. Noise isolation. Noise absorption techniques. Silencers vibrations: Effect, measurement and control measures.

Learning Outcomes:

1. Understand importance of safety at work
2. Understand various safety measures and how it leads to increasing plant productivity.
3. Understand basics of environmental design
4. Understand the control of Ventilation and heat etc.

Recommended Books:

1. H.W. Heinrich, 'Industrial Accident Prevention', McGraw Hill.
2. Beranek, 'Noise Reduction', McGraw Hill.
3. D.C. Reamer, 'Modern Safety and Health Technology', R. Wiley.

REFRIGERATION AND AIR CONDITIONING

Subject Code: BMEE0-F92 **L T P C** **Duration: 42 Hrs.**
3 0 0 3

Course Objectives:

This course deals with the design and implementation of refrigeration and air conditioning systems and building services.

Course Outcomes:

At the end of this course, the student should be able-

1. To understand the principles of refrigeration and air conditioning.
2. To calculate the cooling load for different applications.
3. To select the right equipment for a particular application.
4. Energy Conservation and Management.

Unit – I (10 Hrs.)

Principles of refrigeration, second law of thermodynamics applied to refrigeration, Carnot cycle, reversed Carnot cycle, coefficient of performance, unit of refrigeration. Refrigeration in food industry, types of refrigeration system, mechanical vapour compression, vapour absorption system.

Unit – II (12 Hrs.)

Components of mechanical refrigeration, refrigerant, desirable properties of ideal refrigerant, Centrifugal and steam jet refrigeration systems, thermoelectric refrigeration systems, vortex tube and other refrigeration systems, ultra-low temperature refrigeration, cold storages, insulation material, design of cold storages, defrosting.

Unit – III (10 Hrs.)

Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process.

Unit – IV (10 Hrs.)

Air conditioning: Principles- Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems, humidifiers and dehumidifiers – cooling and calculations, types of air conditioners, applications.

Recommended books & References:

1. C.P. Arora, 'Refrigeration and Air Conditioning', Tata McGraw Hills, 1981.
2. R.J. Dossat, 'Principles of Refrigeration'. Wiley Eastern, 1981.
3. W.F. Stoecker,'Refrigeration and Air Conditioning', 2nd Edn.,McGraw Hill Higher Education, 1983.

ENVIRONMENTAL POLLUTION

Subject Code: BCIE0-F91 **L T P C** **Duration:36 Hrs.**

3 0 0 3

UNIT -I

Introduction: Environment. Pollution, Pollution control

Air Pollution: Air Pollutants: Types, Sources, Effects; Air Pollution Meteorology: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.

Air pollution Control: Self cleansing properties of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles.

UNIT -II

Noise Pollution: Definition; Sound Pressure, Power and Intensity; Noise Measurement, Power and Intensity, Levels, Frequency Band, Effects; Control.

Water pollution: Pollution Characteristics of Typical Industries, Suggested Treatments.

UNIT -III

Global Environmental Issues: Ozone Depletion, Acid Rain, Global Warming-Green House Effects.

UNIT -IV

Administrative Control on Environment: Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects

Recommended Books:

1. G. Masters, W. Ela, 'Introduction to Environmental Engineering and Science', PHI.
2. A. Sincero, G. Sincero 'Environmental Engineering: A Design Approach', PHI.
3. P.V. Rowe 'Environmental Engineering', TMH.
4. S.K. Garg, 'Environmental Engineering', Khanna Publishers.
5. Rao and Rao, 'Air Pollution', TMH.
6. A.K. Chatterjee, 'Water Supply, Waste Disposal and Environmental Pollution Engineering', Khanna Publishers.
7. P. N. Modi, Environmental Engineering, Vol.-II.
8. Rajagopalan, 'Environmental Modelling', Oxford University Press.

TRAFFIC ENGINEERING

Subject Code: BCIE0-F92 **L T P C** **Duration:36 Hrs.**
3 0 0 3

Unit-I

Introduction: Elements of Traffic Engineering, Components of traffic system – road users, vehicles, highways and control devices.

Vehicle Characteristics: IRC standards, Design speed, volume, Highway capacity and levels of service, capacity of urban and rural roads, PCU concept and its limitations.

Unit-II

Traffic Stream Characteristics: Traffic stream parameters, characteristics of interrupted and uninterrupted flows.

Traffic Studies: Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, parking studies, accident studies.

Unit-III

Traffic Regulation and Control: Signs and markings, Traffic System Management, At-grade intersections, Channelization, Roundabouts.

Traffic Signals: Pre-timed and traffic actuated. Design of signal setting, phase diagrams, timing diagram, Signal co-ordination.

Unit-IV

Grade Separated Intersections: Geometric elements for divided and access controlled highways and expressways.

Traffic Safety: Principles and practices, Road safety audit.

Intelligent Transportation System: Applications in Traffic Engineering.

Recommended Books:

1. R.M. William and P.R. Roger, 'Traffic Engineering', Prentice Hall.
2. C.J. Khisty and B.L. Kent, 'Transportation Engineering – An Introduction', Prentice Hall of India Pvt. Ltd.
3. L.R. Kadiyali, 'Traffic Engineering & Transport'.

SOIL MECHANICS

Subject Code: BCIE0-F96 **L T P C** **Duration: 42 Hrs.**
3 0 0 3

Course Objectives:
To impart the knowledge of basic properties of soil, analysis of stresses, bearing capacity of soil etc. Identification and classification of soils, mass/volume phase relationships, effective stress concepts, consolidation theory, shear strength behaviours and soil improvement methods.

Course Outcomes:
1. To understand and experience experimental measurement of the physical and mechanical soil properties commonly used in engineering practice.
2. Students solve problems related to the theoretical part of this course.
3. Students use simple mathematics to derive relationships among soil properties.
4. To understand and be able to analysis techniques used in soil mechanics:
   (a)Consolidation models for load-time-deformation responses of soils.
   (b) Mohr-Coulomb models for shear strength behaviour of soils.

Unit - I (12 Hrs.)

Introduction of soil mechanics, field of soil mechanics, phase diagram physical and index properties of soil classification of soils, general classification based on particles size, textural. Classification and I.S. soil classification system stress condition in soils, effective and neutral stress, Elementary concept of Bousinesque and Wester guards analysis, new mark influence chart.

Unit - II (10 Hrs.)

Shear strength mohr stress circle, theoretical relationship between principle stress circle, theoretical relationship between principal stress mohr-coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear to be circle, theoretical test, Numerical exercise based on various types of tests.

Unit - III (10 Hrs.)

Compaction composition of soils standard and modified protector test, abbot compaction and Jodhpur mini compaction text field compaction method and control. Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory Laboratory consolidation text, calculation of void ratio and coefficient of volume change, Taylor's and Casagrand's method, determination of coefficient of consolidation.

Unit - IV (10 Hrs.)

Earth pressure: Plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure active and passive earth pressure for cohesive soils, simple numerical exercise. Stability of slopes: Introduction to stability analysis of infinite and finite slopes friction circles method Taylor's stability number.

Recommended Books& References:
1. B.C. Punmia, 'Soil Mechanics',Laxmi Publication Pvt. Ltd., New Delhi.
2. K.R. Arora, 'Soil Mechanics and Foundation Engineering',Standard Publication.

DESIGN OF STEEL STRUCTURES

Subject Code: BCIE0-F97 **L T P C** **Duration: 42 Hrs.**
3 0 0 3

Course Objectives:

The objectives of this are to learn the behaviour and design of structural steel components (members and connections in two - dimensional (2D) truss and frame structures) and to gain an educational and comprehensive experience in the design of simple steel structures.

Course Outcomes:

Students who successfully complete this course will be able to:

1. Identify and compute the design loads on a typical steel building.
2. Ability to analyze and design of columns.
3. Ability to analyze and design of beam-columns.
4. Design bolted and welded connections for tension and comp. members and beams.

Unit - I (10 Hrs.)

Structural Steel and Sections: Properties of structural steel as per BIS Codes, Designation of structural steel sections as per BIS.

Compression Members: Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800.

Unit – II (12 Hrs.)

Structural Steel and Connections: Riveted connections, types of rivets, permissible stresses in rivets as per BIS: 800, types of riveted joints, specifications as per BIS 800 for riveted joints and Welded connections: Types of welds, permissible stresses in welds, types of welded connections, design of butt and fillet welded connections subjected to axial loads, testing and inspection of welded joints as per BIS: 800.

Unit – III (10 Hrs.)

Beams BIS specifications for the design of simply supported steel beams including design of base plate at the ends (laterally restrained beams only), structural behaviour, deflected shapes and function of various elements of a plate girder and freehand sketching of a plate girder and its elements.

Unit - IV (10 Hrs.)

Roof Truss (10 hrs) Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering, joint details of roof trusses, loading for roof truss, weight of roof truss, wind loads, snow loads, combination of loads, design of various elements of truss.

Recommended Books& References:

1. A.S. Arya and J.L. Ajmani,'Design of Steel Structures', Nem Chand and Bros., Roorkee.
2. Ram Chandra, 'Design of Steel Structures', Standard Publishers Distributors, Delhi.
3. S.K. Duggal, 'Design of Steel Structures', Standard Publishers Distributors.
4. Kazimi and. Jindal, 'Design of Steel Structures', Prentice Hall of India, New Delhi.
5. L.S.Negi, 'Design of Steel Structure', Tata McGraw Hill, New Delhi.

ELEMENTS OF POWER PLANTS

Subject Code: BELE0-F91 **L T P C** **Duration:36 Hrs.**
3 0 0 3

Learning Objectives:

1. To introduce the students to the classification of steam and hydro-electric power plants and make them familiar with the main equipment and machinery used in them.
2. To provide them basic concepts of nuclear and gas power plants.

3. To impart knowledge about pollution control and combined operation of different plants.

Course Outcomes:

1. The students will acquire knowledge about various equipment used in thermal, hydro and nuclear power generation.
2. They will also become familiar with equipment used in gas power plants.
3. They will come to know about the importance of coordinated operation of different power plants and methods of pollution control.

UNIT-I (10 Hrs.)

Steam Power Plants: Classification of steam generators, types of condensers, types of steam turbines and their efficiencies, Operation of plant, Description of Rankin cycle, coal handling system, combustion system, Ash handling, Feed pumps, Heat exchangers, Economizers, Super heaters, Reheaters, Air preheaters, Feed water heaters, Evaporators.

UNIT-II (8 Hrs.)

Nuclear Power Plants: Nuclear physics, Binding energy, Radioactive decay. Fertile material, Mass defect, Nuclear reactions type and application, Generation of nuclear energy by fission, Nuclear reactors. Safety measures, Future of nuclear power.

UNIT-III (11 Hrs.)

Hydro-Electric Power Plants: Hydrological cycle, Hydrograph, Flow duration curve, Classification of hydro plants, Selection of water turbines for hydro power plant.

Gas Turbine: Elements of gas turbines, Open and closed cycles for gas turbines, Performance terms, Plant layout, applications.

UNIT-IV (9 Hrs.)

Combined Operation of Different Power Plants: Advantages of combined operation of plants, load division between power stations, coordination of different types of Power Plants.

Pollution Control: Pollution from thermal and nuclear plants, Particulate emission and control, electrostatic precipitator, solid waste disposal.

RecommendedBooks:

1. Chakrabarti, Soni, Gupta and Bhatanagar, 'A Textbook on Power System Engineering', Dhanpat Rai & Co., **2013**.
2. EI-Wakil M.M., 'Power Plant Technology', 2nd Reprint, Tata McGraw Hill Edn., **2010**.
3. R.K. Rajput, 'Power Plant Engineering', 4thEdn., Luxmi Publications, **2010**.
4. P.C. Sharma, 'Power Plant Engineering', Kataria and Sons, **2009**.
5. B.G.A.Skrotzki and W.A.Vapot, 'Power Station Engineering and Economy', 31st Reprint, Tata McGraw Hill Education Private Ltd., **2009**.
6. P.K. Nag, 'Power Plant Engineering', 4thEdn., McGraw Hill Education (India) Private Ltd., **2014**.
7. G.R.Nagpal, 'Power Plant Engineering, Khanna Publishers', 16thEdn., **2013**.
8. S.C. Arora, S.Domkundwar, 'Power Plant Engineering', 6thEdn., Dhanpat Rai, **2013**.

BASICS OF INSTRUMENTATION ENGINEERING

Subject Code: BELE0-F92 **L T P C** **Duration:39 Hrs.**
3 0 0 3

Learning Objectives:

1. To acquire knowledge about the various elements of instrumentation systems.

2. To acquire knowledge about working of data acquisition and corresponding signal conditioning.
3. To know about different types of display devices and recorders.

Course Outcomes:

1. Student will get knowledge about various types of transducers, signal conditioning and data acquisition systems.
2. Students will get acquainted with digital measurement systems and display devices
3. Students will be able to know about various types of recorders and recording methods.

UNIT-I (10Hrs.)

Transducers: Introduction to sensors, transducers, detectors, actuators, Electrical transducers, and its classification, Characteristics and choice of transducers, Resistive and Capacitive transducers, Potentiometers, Strain gauges and its types, Thermistors, RTD, Thermocouples, LVDT, RVDT, Piezo electric transducers, Hall effect transducers, Encoders, Synchros.

UNIT-II (10 Hrs.)

Signal Conditioning: Introduction, role of operational amplifiers in signal conditioning, characteristics of op-amps, instrumentation amplifier, filters, general consideration of A/D and D/A convertors.

Data Acquisition Systems: instrumentation systems and its types, Analog data acquisition system, Digital data acquisition system, recorders, multiplexing and sample/hold circuits in data acquisition system.

UNIT-III (9 Hrs.)

Digital Measurement and Display Devices: Introduction, types of instruments used in digital measurement systems, digital display methods, segmental displays, Dot Matrices, rear projection display, LED, LCD, segmental gas discharge displays, Electronic counters, digital voltmeters and its types.

UNIT-IV (10 Hrs.)

Recorders: Requirement of recording, Analog and digital recorders, Graphic recorders, Strip chart recorders, Null type recorders, Potentiometric type recorders, single and multi-point recorders, X-Y records, Ultraviolet recorders, magnetic tape recorders, Frequency and pulse duration modulation type recording, Introduction to direct recording.

Recommended Books:

1. Halfrick Albert D. and Cooper Willium D., 'Modern Electronic Instrumentation and Measurement Techniques', PHI, **1990**.
2. A.K.Sawhney, 'Electronic Instrumentation and Measurement', DhanpatRai and Sons, 19th Edn., **2011**.
3. Jones Larry D. and Chin A. Foster, 'Electronic Instruments and Measurement', 2nd Edn., **1995**.
4. Morris Alan S. and Langari Reza, 'Measurement and Instrumentation, Theory and Applications', Academic Press, Elsevier, **2016**.
5. Malaric Roman, 'Instrumentation and Measurement in Electrical Engineering', Brown Walker Press, Boca Raton, Florida, USA, **2011**.
6. David Bell, 'Electronic Instrumentation and Measurements', 2nd Edn., PHI,**2003**.
7. M.M.S.Anand, 'Electronic Instruments and Instrumentation Technology', PHI, **2004**.
8. H.S.Kalsi, 'Electronic Instrumentation', 2nd Edn., TMH, **2006**.

SUBSTATION EQUIPMENT

Subject Code: BELE0-F93 **L T P C** **Duration:39 Hrs.**

3 0 0 3

Learning Objectives:

1. To provide knowledge about substation, its layout and main equipment present in it.
2. To impart knowledge about power, current and potential transformer.
3. To understand the use of capacitor banks in a substation.

Course Outcomes:

1. Students will get familiar with main equipment used in substations.
2. They will be able to know about the use of different types of transformers.
3. They will develop understanding about the importance of capacitor banks.

UNIT-1 (10 Hrs.)

Substation: Introduction, classification and layout of substation, Single Bus bar, Mesh Substation, Factors affecting layout of substation, types of bus bars, Substation equipment specifications, testing of substation Equipment.

Power Transformer: Introduction and Working Principle of Power Transformer, Classification and their types, important characteristics of Transformer Oil.

UNIT-II (10 Hrs.)

Current Transformers (CT): Basic functions of Current Transformer, Rating and Performance of CTs, Burden, Theory and Operation of CT, Diagram of CT's Connection of Power Transformer and Selection of CT.

Potential Transformers (PT): Terminology, requirement of VA Burden, Testing and Commissioning of PTs, Capacitor Voltage Transformer.

Earthing: Introduction and purpose of Earthing, tolerable limits of body currents, soil resistivity, earth resistance and its measurement, tolerable and actual step and touch voltage, types of Earthing, grounded and ungrounded neutral system, Types, Methods and selection of grounding neutral.

UNIT-III (9 Hrs.)

Capacitor Banks: - Need for Reactive Compensation, Power Factor Improvement and its Benefits, Purpose of Installation of Capacitor Bank, Protection of Capacitor Bank and Pre-Commissioning Checks and tests, Series and Shunt Compensators, Rating and operation of Shunt Capacitor banks.

UNIT-IV (10 Hrs.)

Station Battery and Charging Equipment: Introduction, Variable Load Battery and System Tester, Testing of Battery Charger and Battery, Types of Batteries, Basic Charging Methods.

Computer Applications in Substation Engineering: Introduction, System Components, Communication Infrastructure and Methods, Trends in SCADA, Remote Terminal Unit, MODEM.

Recommended Books:

1. R.S. Dahiya and Attri Vinay, 'Sub Station Engineering, Design, Concepts and Computer Application', S.K. Kataria& Sons Publishers, **2013.**
2. S. Rao, 'Electrical Substation Engineering and Practice', Khanna Publishers, **1992**
3. P.S.Satnam and P.V. Gupta, 'Substation Design and Equipment', Dhanpat Rai Publications, **2013**.
4. McDonald John D., 'Electric Power Substations Engineering', 3rd Edn., CRC Press, **2012.**

NUMERICAL ANALYSIS

Subject Code: BMAT0-F91 **L T P C** **Duration: 45 Hrs.**
3 1 04

UNIT-1 (10 Hrs.)

Methods to Finding Roots of Polynomials: Algebraic and Transcendental equations: Bisection method, Iteration method, Regula falsi method, Secant method, Newton-Raphson method, Convergence of these methods, Methods for multiple roots: Newton Raphson method, Muller's method, Solution of Non-linear simultaneous equations: Seidel method and Newton Raphson method.

UNIT-2 (10 Hrs.)

System of Linear Algebraic Equations: Direct methods-Gauss elimination method, Gauss Jordon method, LU factorization method, Iterative Methods -Jacobi and Gauss-Seidal methods.
Interpolation: Finite differences, Newton forward and backward formula, Lagrange's formulae with error, Divided differences, Newton's formulae, Central differences, Hermite interpolation.

UNIT-3 (13 Hrs.)

Numerical Differentiation and Integration: Differentiation at tabulated and non-tabulated points, Maximum and minimum values of tabulated function, Newton-Cotes Formulae-Trapezoidal, Simpson's, Boole's and Weddle's rules of integration, Romberg integration, Gaussian integration, Double integration by Trapezoidal and Simpson rules.

UNIT-4 (12 Hrs.)

Methods to Solve Ordinary Differential Equation: Ordinary differential equations: Taylor series and Picard's methods, Euler and modified Euler methods, Runge–Kutta method (4^{th} order), Predictor- Corrector methods: Adams-Bash forth and Milne methods.

Recommended Books:

1. B. Bradie, 'A Friendly Introduction to Numerical Analysis', Pearson Prentice Hall, **2006**.
2. K.E. Atkinson, 'Introduction to Numerical Analysis', 2^{nd}Edn., John Wiley, **1989**.
3. S.D. Conte and C. De Boor, 'Elementary Numerical Analysis: An Algorithmic Approach', 3^{rd}Edn, McGraw Hill, New York, **1980**.
4. J.B. Scarborough, 'Numerical Mathematical Analysis', Oxford & IBH Publishing Co., **2001**.
5. B.S.Grewal, 'Higher Engineering Mathematics', 42^{nd}Edn., Khanna Publishers, **2016**.

Environmental Technology & Safety

Subject Code: BCIE0-F91 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Unit I

Basic Environmental Compartments: Air pollution, Water pollution, Land pollution, Hazardous material s in relation to petroleum industry, HAZOP analysis, Environmental Impact of Gas flaring, sampling methods, Environmental control and engineering – aqueous wastes, emission to the atmosphere, noise pollution.

Unit II

Fire Hazards and Control: Components of Fire, Classification of Fires and Fire Extinguishment, Fire safety equipments, Causes of Refinery Fires and Explosion Hazards, Safety in Handling and Storage, Emergency Preparation, DOW fire index.

Unit III

Waste Disposal and Treatment: Surface and subsurface disposal, treatment of water, solid material and air emissions, Oil field waste management, effluent water treatment methods, sampling methods.

Other Aspects: Occupational health hazards, Estimation of Total Petroleum Hydrocarbon (TPH) and suggested measures. Case studies of history of accidents in petroleum industry**.**

Unit IV

Regulatory Approaches and Safety Measures: Provisions in the oil mines regulation act in India related to management, drilling, production and transport. Protect ion against leakage and fire, care of machinery, plant and equipment, Safety aspect s during drilling, logging, production, transportation, handling etc at onshore and offshore. Emergency Response Plan (ERP), Regulatory requirements for ERP, Determination of initial planning zone.

Books Recommended:

1. Boesch D F and Rabalis Nancy, Long-term Environmental Effects of Offshore Oil and Gas Development, Elsevier Applied Science, 2003, 719 pp.

2. Boyce, A., "Introduction to Environmental Technology", John Wiley and Sons, 1996.

3. Orzu Orszulik, "Environmental Technology in oil Industry", Springer – Verlag, 1996.

4. Reis, J.C., "Environmental control in Petroleum Engineering", Gulf publications.1998.

OBJECT ORIENTED PROGRAMMING USING C++

Subject Code- BCSE0-F92 **L T P C** **Duration – 45 hrs**
3 0 0 3

COURSE OBJECTIVE

To introduce the principles and paradigms of Object Oriented Programming Language for design and implement the Object Oriented System

COURSE OUTCOME

CO1 To introduce the basic concepts of object oriented programming language and its representation

CO2 To allocate dynamic memory, access private members of class and the behavior of inheritance and its implementation.

CO3 To introduce polymorphism, interface design and overloading of operator.

CO4 To handle backup system using file, general purpose template and handling of raised exception during programming

COURSE CONTENT

UNIT-I (11 hrs)

Introduction to C++, C++ Standard Library, Illustrative Simple C++ Programs. Header Files, Namespaces, Application of object oriented programming.

Object Oriented Concepts, Introduction to Objects and Object Oriented Programming, Encapsulation, Polymorphism, Overloading, Inheritance, Abstract Classes, Accessifier (public/ protected/ private), Class Scope and Accessing Class Members, Controlling Access Function, Constant, Class Member, Structure and Class

UNIT-II (12 hrs)

Friend Function and Friend Classes, This Pointer, Dynamic Memory Allocation and Deallocation (New and Delete), Static Class Members, Constructors, parameter Constructors and Copy Constructors, Deconstructors,

Introduction of inheritance, Types of Inheritance, Overriding Base Class Members in a Derived Class, Public, Protected and Private Inheritance, Effect of Constructors and Deconstructors of Base Class in Derived Classes.

UNIT-III (11 hrs)

Polymorphism, Pointer to Derived class, Virtual Functions, Pure Virtual Function, Abstract Base Classes, Static and Dynamic Binding, Virtual Deconstructors.

UNIT-IV (11 hrs)

Fundamentals of Operator Overloading, Rules for Operators Overloading, Implementation of Operator Overloading Like <<,>> Unary Operators, Binary Operators.

Text Streams and binary stream, Sequential and Random Access File, Stream Input/ Output Classes, Stream Manipulators.

RECOMMENDED BOOKS:

1. Robert Lafore, 'Object Oriented Programming in Turbo C++', 2nd Ed., The WAITE Group Press, **1994**.
2. Herbert shield, 'The complete reference C ++', 4th Ed., Tata McGraw Hill, **2003**.
3. Shukla, 'Object Oriented Programming in C++', Wiley India, 2008.
4. H M Deitel and P J Deitel, 'C++ How to Program', 2nd Ed., Prentice Hall, **1998**.
5. D Ravichandran, 'Programming with C++', 3rd Ed., Tata McGraw Hill, **2003**.
6. Bjarne Stroustrup, 'The C++ Programming Language', 4th Ed., Addison Wesley,**2013**.

R. S. Salaria, 'Mastering Object-Oriented Programming with C++', Salaria Publishing House, **2016**.

NOTE: This Subject is common to all branches. Only Introduction of the concepts is given to the students.

ESSENTIALS OF IT

Subject Code- BCSE0-F93 **L T P C** **Duration – 45 hrs**

3 0 0 3

COURSE OBJECTIVE: The proposed course exposes the engineering/MCA students to IT Essentials. The Core Modules of this course includes Programming, Database, Web technologies and Software Engineering. This program is independent of any organization / product / technology.

COURSE OUTCOMES:

CO1: To Learn Problem Solving Concepts

CO2: to learn Object Oriented Programming using Java
CO3: To learn Relational DataBase Management System concepts
CO4: To learn Web Technologies and Software Engineering concept

COURSE CONTENT

UNIT-I (11 Hrs)

Focus Area 1: Object Oriented Programming using Java:

Problem Solving Techniques - Introduction to problem solving - Computational problem and its classification - Logic and its types - Introduction to algorithms Implementation of algorithms using flowchart - Searching and sorting algorithms - Introduction and classification to Data Structures - Basic Data Structures - Advanced Data Structures Tools: Understanding basic programming constructs using Scratch Tool - Flowcharts implementation through RAPTOR tool

Programming Basics : Identifiers, variables, data types, operators, control structures, type conversion, casting, arrays, strings • Introduction to UML : Use case diagrams – Class diagrams Object Oriented Concepts fundamentals : class & object – instance variables & methods – access specifiers – reference variables – parameter passing techniques – constructors – this reference – static – command line arguments Tools : Eclipse IDE for Java programming

UNIT-II (12 HRS)

Relationships: Inheritance – types of inheritance – aggregation – association – Static Polymorphism: method overloading – constructor overloading – Dynamic polymorphism: method overriding – abstract – interface – introduction to packages Industry Coding Standards and Best Practices – code tuning & optimization – clean code & refactoring

UNIT-III (11 Hours)

Focus Area 2: Relational DataBase Management System:

RDBMS- data processing – the database technology – data models- ER modeling concept – notations – converting ER diagram into relational schema - Logical database design - normalization (1NF, 2NF and 3NF)

SQL – DDL statements – DML statements – DCL statements - Joins - Sub queries – Views - Database design Issues – SQL fine tuning

UNIT-IV (11 Hours)

Focus Area 3: Web Technologies and Software Engineering

Introduction to user interface and web technologies: web fundamentals – types web content – HTML – text formatting tags in HTML – HTML form elements - and tags - text formatting using CSS: embedded CSS, inline CSS and external CSS – JavaScript and its features.

Software Engineering: Definition – role of software and software crisis – SDLC models: waterfall model, incremental model and spiral model – software testing – static & dynamic testing – types testing: unit testing, integration testing, system testing, performance testing and regression testing

NOTE: This Subject is common to all branches. Only Introduction of the concepts is given to the students.

RECOMMENDED BOOKS

1. Andrew S. Tanenbaum, 'Structured Computer Organization', PHI, 4th ed., **1999**

2. John L. Hennessy, David Goldberg, David A. Patterson, 'Computer Architecture: A Quantitative Approach', 2nd Ed., Morgan Kaufman Publishers, **1996**
3. Silberschatz and Galvin, 'Operating System Concepts', John Wiley & Sons, 6th ed.
4. Andrew Tanenbaum, 'Modern Operating Systems', Pearson Education, 4th ed.
5. Milan Milenkovic, 'Operating Systems: concepts and design', McGraw-Hill, **1992**
6. Charles Crowley, 'Operating Systems: A Design-Oriented Approach', Irwin Professional Publishing, **1996**
7. Dromey, R.G., 'How to solve it by computers', Prentice Hall, **2005**
8. Alfred V.Aho, Ullman, Hopcroft, 'Data Structures and Algorithms', Addison-wesely, **1983**.
9. Lipschutz, Seymour & G A V Pai, 'Data Structures', Tata McGraw – Hill, **2015**
10. Baldwin, Douglas & Scragg, Greg W., 'Algorithms and Data Structures the Science of Computing', Dreamtech
11. Kernighan., Ritchie, 'ANSI C Language', Prentice Hall, **1992**.
12. Yashwant Kanitker, 'Let Us C', 2nd Ed.
13. Schaum series, 'Programming in C', 3rd Ed.
14. Jon Bentley, 'Programming Pearls', Pearson Education publication
15. Aho, Alfred V, 'Compiler Principles, Techniques and Tools',Pearson Education
16. Tharp Alan L, 'File Organization and Processing,' John Willey and Sons
17. Henry F Korth, Abraham Silberschatz, 'Database system concepts', 2nd ed., McGraw-Hill International editions, Computer Science series, **1991**
18. Elmasri, Navathe, 'Fundamentals of Database Systems', 3rd ed, Addison Wesley.
19. C.J.Date , 'An introduction to Database Systems', 6th ed, Narosa Publications
20. Thomas Powell, 'HTML & CSS: The Complete Reference', 5th Edition (Complete Reference Series) Paperback
21. Craig Grannel, 'The Essential Guide to CSS and HTML Web Design', Apress, Corr. 3rd printing ed., **2008**
22. David Flanagan, 'JavaScript: The Definitive Guide', 6th Ed., O'Reilly, **2011**
23. Thomas Powell, 'JavaScript: The Complete Reference Paperback', 3rd ed., McGraw-Hill Education, **2012**
24. Roger S Pressman, 'Software Engineering: A Beginner's Guide Paperback'7th ed., McGraw Hill Education, **2009**