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ELECTRONICS AND INSTRUMENTATION ENGG./  
APPLIED ELECTRONICS AND INSTRUMENTATION

**ANALOG ELECTRONICS CIRCUIT (3-0-2)**

**MODULE - I**

**(12 Hours)**

**MOS Field-Effect Transistor:** Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E-MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch. (4 Hours)

**Biasing of BJTs:** Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples. (4 Hours)

**Biasing of FETs and MOSFETs:** Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

**MODULE - II**

**(12 Hours)**

**Small Signal Analysis of BJTs:** Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of  $R_S$  and  $R_L$  on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits. (6 Hours)

**Small Signal Analysis of FETs:** Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of  $R_{SIG}$  and  $R_L$  on CS Amplifier; Source Follower and Cascaded System. (6 Hours)

**MODULE - III**

**(5 hours)**

**High Frequency Response of FETs and BJTs:** High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier. (5 Hours)

**MODULE - IV (9 hours)**

**Feedback amplifier and Oscillators:** Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. (4 Hours)

**Operational Amplifier:** Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier. (5Hours)

**Additional Module (Terminal Examination-Internal)**

**(6 hours)**

Basic analysis of difference amplifier, Simulation of analog circuits i.e., different single and cascaded amplifier circuits, difference amplifier circuits and validating the theoretical parameters using PSpice and MULTISIM. Analysis op-amp IC circuits using LF411 and  $\mu A$  741, Signal Generators using OPAMP: Square, triangle and ramp generator circuits using opamps - Effect of slew rate on waveform generation-introduction to analog simulation OPAMP as nonlinear element: comparator, Voltage controlled oscillator (VCO). Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

### **Text Books**

1. Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9<sup>th</sup>/10<sup>th</sup> Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
2. Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2<sup>nd</sup> Edition,2008.

### **Reference Books**

1. Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5<sup>th</sup> Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
2. Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition, (*For Problem Solving*)
3. Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition,2002.
4. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2<sup>nd</sup> Edition.2004.
5. Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
6. Electronic device and circuits, David A. Bell, Oxford University Press, 5<sup>th</sup>edition,2008.
7. Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009

## **ANALOG ELECTRONICS CIRCUIT LAB**

### ***List of Experiments***

**(At least 10 out of 12 experiments should be done)**

1. Design and simulate BJT bias circuit and compare the results.
2. Design and simulate JEET/MOSFET bias circuit and compare the results.
3. Design and simulate BJT common-emitter circuit and compare D.C and A.C performance:
4. Design and simulate JFET/MOSFET common-emitter circuit and compare D.C and A.C performance:
5. Determining the frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response and compare with simulated results.
6. Differential amplifiers circuits: D.C bias and A.C operation without and with current source.
7. Study of Darlington connection and current mirror circuits.
8. OP-Amp Frequency Response and Compensation.
9. Application of Op-Amp as differentiator, integrator, square wave generator.
10. Obtain the band width of FET/ BJT using Square wave testing of an amplifier.
11. R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.
12. Class A and Class B Power Amplifier.

## **ELECTRICAL AND ELECTRONICS MEASUREMENT(3-0-2)**

### **MODULE- I**

**[10 Hrs]**

#### **University Portion (80%): (8 Hrs)**

**Measurement and Error: (2Hrs)** Definition, Accuracy and Precision, Significant Figures, Types of Errors. **Text book-2-Ch-[1.1 to 1.4]**

**Standards of Measurement: (1 Hrs)** Classification of Standards, Electrical Standards, IEEE Standards. **Text Book-2- Ch-[3.1,3.4,3.6]**

**Types of measuring instrument: (5 Hrs)** Ammeter and Voltmeter: Derivation for Deflecting Torque of; PMMC, MI (attraction and repulsion types), Electro Dynamometer and Induction type Ammeters and Voltmeters. Energy meters and wattmeter.:Construction, Theory and Principle of operation of Electro-Dynamometer and Induction type wattmeter, compensation, creep, error, testing, Single Phase and Polyphase Induction type Watt-hour meters. Frequency Meters: Vibrating reed type, electrical resonance type, Power Factor Meters. **Text Book-1- Ch-[XVIII,XIX,XX,XXI,XXII]**

#### **College/Institute Portion (20%): (2 Hrs)**

**Measuring instruments:** Absolute and secondary instrument, indicating and recording instrument. **Text Book-1- Ch-XVII.** Or related advanced topics as decided by the concerned faculty teaching the subject.

### **MODULE-II**

**[10 Hrs]**

#### **University Portion(80%): (8 Hrs)**

#### **Measurement of Resistance, Inductance and Capacitance: (8 Hrs)**

**Resistance:** Measurement of Low Resistance by Kelvin's Double Bridge, Measurement of Medium Resistance, Measurement of High Resistance, Measurement of Resistance of Insulating Materials, Portable Resistance Testing set (Megohmmeter), Measurement of Insulation Resistance when Power is ON, Measurement of Resistance of Earth Connections.

**Inductance:** Measurement of Self Inductance by Ammeter and Voltmeter, and AC Bridges (Maxwell's, Hay's, & Anderson Bridge), Measurement of Mutual Inductance by Felici's Method, and as Self Inductance.

**Capacitance:** Measurement of Capacitance by Ammeter and Voltmeter, and AC Bridges (Owen's, Schering & Wien's Bridge), Screening of Bridge Components and Wagner Earthing Device. **Text Book-1- Ch-[VI, VII]**

#### **College/Institute Portion (20%): (2 Hrs)**

**Transducer:** Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Piezo-Electric transducers, Optical Transducer, Torque meters, inductive torque transducers, electric tachometers, photo-electric tachometers, Hall Effect Transducer. (**Text Book-2- Ch-11.1 to 11.6**). Or related advanced topics as decided by the concerned faculty teaching the subject.

**MODULE- III**

**[10 Hrs]**

**University Portion (80%): (8 Hrs)**

**Galvanometer: (5 Hrs)** Construction, Theory and Principle of operation of D'Arsonval, Vibration (Moving Magnet & Moving Coil types), and Ballistic Galvanometer, Influence of Resistance on Damping, Logarithmic decrement, Calibration of Galvanometers, Galvanometer Constants, Measurement of Flux and Magnetic Field by using Galvanometers.

**Potentiometer: (3 Hrs)** Construction, Theory and Principle of operation of DC Potentiometers (Crompton, Vernier, Constant Resistance, & Deflection Potentiometer), and AC Potentiometers (Drysdale-Tinsley & Gall-Tinsley Potentiometer). **Text**

**Book-1- Ch-[ VIII,IX]**

**College/Institute Portion (20%): (2 Hrs)**

pH- Meter, volt ratio boxes and other auxiliary apparatus. **Text Book-1- Ch- VIII.** Or related advanced topics as decided by the concerned faculty teaching the subject.

**MODULE- IV**

**[10 Hrs]**

**University Portion(80%): (8 Hrs)**

**Current Transformer and Potential Transformer :(3 Hrs)** Construction, Theory, Characteristics and Testing of CTs and PTs.

**Electronic Instruments for Measuring Basic Parameters:(2 Hrs)** Amplified DC Meters, AC Voltmeters using Rectifiers, True RMS Voltmeter, Considerations for choosing an Analog Voltmeter, Digital Voltmeters (Block Diagrams only), Q-meter

**Oscilloscope:(3 Hrs)** Block Diagrams, Delay Line, Multiple Trace, Oscilloscope Probes, Oscilloscope Techniques, Introduction to Analog and Digital Storage Oscilloscopes, Measurement of Frequency, Phase Angle, and Time Delay using Oscilloscope.

**Text Book-2- Ch- [6.2 to 6.9, 7.2, 7.6, 7.7]**

**College/Institute Portion (20%): (2 Hrs)**

[Wave analyser and Counter. (**Text Book-2- Ch- 9.2,9.3,9.4,10.1**)]. Or related advanced topics as decided by the concerned faculty teaching the subject.

**Text Book(s):**

1. Electrical Measurements and Measuring Instruments – Golding & Widdis – 5th Edition, Reem Publication.
2. Modern Electronic Instrumentation and Measurement Techniques – Helfrick & Cooper – Pearson Education.

**Reference Book(s):**

1. A Course in Electrical and Electronic Measurements and Instrumentation – A K Sawhney – Dhanpat Rai & Co.
2. Electronic Instrumentation and Measurement, 3E by David A. Bell, Oxford University Press
3. Electronic Instrumentation – H C Kalsi – 2nd Edition, Tata McGraw Hill.
4. Electronic Measurement and Instrumentation – Oliver & Cage – Tata McGraw Hill.

## **ELECTRICAL AND ELECTRONICS MEASUREMENT LAB**

**Select any 8 experiments from the list of 10 experiments**

1. Measurement of Low Resistance by Kelvin's Double Bridge Method.
2. Measurement of Self Inductance and Capacitance using Bridges.
3. Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.
4. Calibration of Voltmeters and Ammeters using Potentiometers.
5. Testing of Energy meters (Single phase type).
6. Measurement of Iron Loss from B-H Curve by using CRO.
7. Measurement of R, L, and C using Q-meter.
8. Measurement of Power in a single phase circuit by using CTs and PTs.
9. Measurement of Power and Power Factor in a three phase AC circuit by two-wattmeter method.
10. Study of Spectrum Analyzers.

## **ENERGY CONVERSION DEVICES (3-0-2)**

### **University Level**

#### **MODULE-I**

**(12Hrs)**

**GENERAL PRINCIPLES OF DC MACHINES:** Constructional Features, Methods of Excitation, Expression for EMF Induced and Torque Developed in the Armature.

**DC GENERATORS:** No Load Characteristics for Separately Excited DC Generator and DC Shunt Generator, Conditions for Self Excitation, Critical Resistance and Critical Speed, Losses and Efficiency.

**DC MOTORS:** Speed~Armature Current, Torque~Armature Current and Speed~Torque Characteristic for (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Speed control and Starting of DC shunt and DC series motors, Comparison Between Different types of DC Motors and their Application.

#### **MODULE-II**

**(9 Hrs)**

**TRANSFORMERS:** Constructional Features, EMF Equation, Turns Ratio, And Determination of Parameters From Tests (Open Circuit Test and Short Circuit Test), Equivalent Circuit, Losses and Efficiency, Introduction to Three Phase Transformers: Three Single Phase Transformers Connected as a Bank of Three Phase Transformer, Introduction to Auto transformer

**THREE PHASE SYNCHRONOUS MACHINES:** Constructional Features, Principle of operation as Alternator and Synchronous Motor, Starting of Synchronous Motor.

**MODULE-III**

**(9 Hrs)**

**THREE PHASE INDUCTION MOTORS:** Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, Concept of Slip, Slip~Torque Characteristics, Starting of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Speed Control of Induction Motors

Principles of Single phase Induction motors, stepper motor, AC & DC servo motor and their application

**Institution Level**

Revolving Field Theory, Split Phase (capacitor start and run) and Shaded Pole Starting of Single Phase Induction Motors, Speed~Current, Torque~Current and Speed~Torque Characteristic for Single Phase AC Series Motor.

**Text Book :**

1. Theory and Performance of AC Machines – M G Say – CBS Publication
2. The Performance and Design of DC Machines – A E Clayton

**Reference Book(s):**

1. Electric Machines – D P Kothari & I J Nagrath – Tata McGraw Hill.
2. Electrical Machinery – P S Bimbhra – Khanna Publishers.
3. Electric Machinery – Fitzgerald, Charles Kingsley Jr., S. D. Umans – Tata McGraw Hill.
4. Electric Machinery And Transformers – Guru & Hiziroglu – Oxford University Press.

**ENERGY CONVERSION DEVICES LAB**

**(Select any 8 experiments from the list of 10 experiments)**

1. Determination of critical resistance and critical speed from no load test of a DC shunt generator.
2. Plotting of Magnetization characteristics of a separately excited DC generator.
3. Starting of DC shunt motors by 3-point/ 4-point starter.
4. Speed control of DC shunt motor by armature control and flux control method.
5. Determination of Efficiency by Open Circuit and Short Circuit test on single phase transformer.
6. Polarity test and Parallel operation of two single phase transformers.
7. Load test of three phase induction motors.
8. Speed control of induction motor using frequency control.
9. Calculation of slip and efficiency of three phase squirrel cage induction motor at full load.
10. Starting of single phase induction motors

## **NETWORK THEORY(3-0-2)**

### **MODULE- I (10 Hrs)**

**Network Topology:**Graph of a network; Concept of tree; Incidence matrix; Tie-set matrix; Cut-set matrix; Formulation and solution of network equilibrium equations on loop and node basis.

**Network Theorems & Coupled Circuits:**Substitution theorem; Reciprocity theorem; Maximum power transfer theorem; Tellegen's theorem; Millman's theorem; Compensation theorem; Coupled Circuits; Dot Convention for representing coupled circuits; Coefficient of coupling.

### **MODULE- II (08 Hrs)**

**Laplace Transform & Its Application:**Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).

### **MODULE- III (08 Hrs)**

**Two Port Network Functions & Responses:**  $z$ ,  $y$ , ABCD and  $h$ -parameters; Reciprocity and Symmetry; Interrelation of two-port parameters, Interconnection of two-port networks; Network Functions; Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.

### **MODULE- IV (08 Hrs)**

**Fourier Series and Fourier Transform:** Fourier series, Fourier analysis and evaluation of coefficients; Steady state response of network to periodic signals; Fourier transform and convergence; Fourier transform of some functions; Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response.

### **Additonal Module (Terminal Examination-Internal) (08 hours)**

**Network Synthesis:** On network synthesis.

#### **Text Book(s)**

1. Network Analysis, M E Van Valkenburg, PHI, third edition.
2. Fundamentals of Electric Circuits, Charles K Alexander & Mathew N.O. Sadiku, Tata McGraw Hill, fifth edition.

#### **Reference Book(s)**

1. Network Theory, Smarajit Ghosh, PHI, first edition(2005)
2. Network Theory, P K Satpathy, P Kabisatpathy, S P Ghosh and A K Chakraborty  
Tata McGraw Hill, New Delhi.
3. Fundamentals of Network analysis and Synthesis, K.M.Soni, S.K.Kataria and Sons  
(2010) ninth edition
4. Network Analysis and Synthesis, Franklin F. Kuo ,Wiley Student Edition, second  
edition 2006



## NETWORK THEORY LAB

### *List of Experiments*

**(At least 8 out of 10 experiments should be done)**

1. Verification of Network Theorems (Superposition, Thevenin, Norton, Maximum Power Transfer).
2. Study of DC and AC Transients.
3. Determination of circuit parameters: Open Circuit and Short Circuit parameters.
4. Determination of circuit parameters: Hybrid and Transmission parameters.
5. Frequency response of Low pass and High Pass Filters.
6. Frequency response of Band pass and Band Elimination Filters.
7. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
8. Study of resonance in R-L-C series circuit.
9. Study of resonance in R-L-C parallel circuit.
10. Spectral analysis of a non-sinusoidal waveform.

## ELECTROMAGNETIC FIELD THEORY(3-1-0)

### MODULE – I (13 Hours)

**1. Vectors and Fields:** Cartesian Coordinate System, Cylindrical and Spherical coordinate system, Vector Algebra, Scalar and Vector Fields, gradient, divergence, curl operations, The Laplacian, Divergence Theorem, Stoke's Theorem, Useful vector identities and their derivations. (selected portions from 1.01 to 1.05 of TB-1)

**2.: Electric and Magnetic fields:** Field due to a line/sheet/volume charge, Biot \_Savart Law, Gauss's Law for Electric Field and Magnetic Field, Fields of electric and magnetic dipoles, Applications of electrostatics and magnetostatics, Faraday's Law, Ampere's Circuital Law. (portions 3.4.to 3.6, 4.4.3,4.6, 4.8,4.9, 8.3 to 8.8 and 9.2 of TB-2)

**3. Maxwell's Equations:** Divergence and Differential Form, Line Integral, Surface Integral and Integral form, Faradays Law, Ampere's Circuital Law, Gauss's Law for Electric Field and Magnetic Field. (portions 4.01 to 4.03 of TB-1)

### MODULE – II (13 Hours) (Portions 5.01 to 5.13 of TB-1)

**4. Wave Propagation in Free Space:** The electromagnetic wave equation and its solution, Uniform Plane Waves, Direction cosines, Concept on TEM mode, Poynting Vector and Power density

**5. Wave Propagation in Material Media:** Conductors and Dielectrics, Magnetic Materials, Wave Equation and Solution, Uniform Plane Waves in Dielectrics and Conductors, Polarization, Boundary Conditions, Reflection and Transmission of Uniform Plane Waves at the boundary of two media for normal and oblique incidence, Brewster's angle.

**MODULE - III (10 Hours)**

**6. Transmission Line Analysis:** Transmission lines, Circuit representation of a parallel plane transmission line, Parallel plane transmission lines with loss, E and H about long parallel cylindrical conductors of arbitrary cross section, Transmission line theory, UHF lines as circuit elements (portions 7.10 to 7.16 of TB-1)

**7. Wave Guide Principles:** Rectangular guides, TM waves in rectangular guides, TE waves in rectangular guides, Impossibility of TEM wave in wave guides, wave impedance and characteristic impedances, Attenuation factor and Q of wave guides, Dielectric Slab Guide ,(portions 8.01 to 8.04, 8.08,8.10,8.11 of TB-1).

**Text Book(s):**

1. Electromagnetic Waves and Radiating Systems, 2nd Edition, E.C. Jordan and K.G. Balmain, Pearson Education, New Delhi.
2. Engineering Electromagnetic, 2nd Edition, Nathan Ida, Springer
3. Electromagnetic, 2nd Edition, Joseph A. Edminister, adapted by Vishnu Priye, Tata McGraw Hill Publishing Company Ltd., New Delhi. (For Problem Solving)

**Reference Book(s):**

1. Fundamentals of Electromagnetic for Engineering, First Impression – 2009, N. N. Rao, Pearson Education, New Delhi.
2. Engineering Electromagnetic, 7th Edition, William H. Hyat, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Elements of Electromagnetic, Mathew N.O. Sadiku, Oxford University Press, New Delhi.
4. Electromagnetic Field Theory Fundamentals, B.S. Guru and H.R. Hiziroglu, PWS Publishing Company, a division of Thomson Learning Inc

**ENGINEERING ECONOMICS**

*Theory L/T (Hours per week):2/1, Credit: 3*

**Module I (12 hours)**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

**Module II (12 hours)**

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank. Inflation-Meaning of inflation, types, causes, measures to control inflation. National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects . Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

#### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

**Credit- 3      Class Hours - 40**

#### Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality	10

and job – fit theory), Personality Tests and their practical applications.

**Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

**Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

**03 Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **9**

**Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

**Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

**04 Organizational Culture :** Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality. **8**

**05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. **7**

Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

**HONOURS SUBJECT**

**SOLID STATE DEVICES (4-0-0)**

80% University Level:

**Module-I**

**(11 hours)**

**Introduction to Quantum Mechanics:** Principles of Quantum Mechanics , Energy Quanta, Schrodinger's Wave Equation, Applications of Schrodinger's Wave Equation, Extensions of the Wave Theory to Atoms

**Introduction to the Quantum Theory of Solids:** Allowed and Forbidden Energy Bands, Electrical Conduction in Solids, Extension to Three Dimensions, Density of States Function, Statistical Mechanics: The Fermi-Dirac Probability Function, The Distribution Function and the Fermi Energy

**The Semiconductor in Equilibrium:** Charge Carriers in Semiconductors, Dopant Atoms and Energy Levels: Qualitative Description, Ionization Energy, The Extrinsic Semiconductor: Equilibrium Distribution of Electrons and Holes, The  $n_0p_0$  Product, The Fermi-Dirac Integral, Degenerate and Non degenerate Semiconductors, Statistics of Donors and Acceptors, Charge Neutrality, Position of Fermi Energy Level.

**Module-II**

**(12 hours)**

**Carrier Transport Phenomena:** Carrier Drift: Drift Current Density, Mobility Effects, Conductivity, Velocity Saturation, Carrier Diffusion, Graded Impurity Distribution, The Hall Effect

**Non-equilibrium Excess Carriers in Semiconductors:** The Semiconductor in Equilibrium, Excess Carrier Generation and Recombination, Characteristics of Excess Carriers, Continuity Equations, Time-Dependent Diffusion Equations, Ambipolar Transport Quasi-Fermi Energy Levels, Excess Carrier Lifetime, Surface Effects

**The pn Junction:** Basic Structure of the pn Junction, Zero Applied Bias: Built-in Potential Barrier, Electric Field, Space Charge Width, Reverse Applied Bias: Space Charge Width and Electric Field , Junction Capacitance, One-Sided Junctions , Junction Breakdown, Non uniformly Doped Junctions: Linearly Graded Junctions

**The pn Junction Diode:** pn Junction Current, Small-Signal Model of the pn Junction, Diode current equation, Junction breakdown, Charge Storage and Diode Transients: The Turn-off Transient, The Turn-on Transient.

**Metal-Semiconductor and Semiconductor Hetero junctions:** The Schottky Barrier Diode, Metal-Semiconductor Ohmic Contacts, Hetero-junctions

**Module-III**

**(10 hours)**

**The Bipolar Transistor:** The Bipolar Transistor Action, Minority Carrier Distribution, Transistor Currents and Low-Frequency Common-Base Current Gain, Nonideal Effects, Equivalent Circuit Models, Frequency Limitations, Large-Signal Switching

**The Junction Field-Effect Transistor:** JFET Concepts: Basic pn JFET Operation, Basic MESFET Operation, The Device Characteristics, Nonideal Effects, Equivalent Circuit and Frequency Limitations.

**Metal-Oxide-Semiconductor Field-Effect Transistor:** The Two-Terminal MOS Structure: Energy-Band Diagrams, Depletion Layer Thickness, Surface Charge Density, Work Function Differences, Flat-Band Voltage, Threshold Voltage, Capacitance-Voltage Characteristics, The Basic MOSFET Operation, Frequency Limitations, The CMOS Technology, Nonideal Effects, MOSFET Scaling, Threshold Voltage Modifications.

**20% Institution Level:**

**9 hours**

**Optoelectronics and High Frequency, High Power, Nanoelectronic Semiconductor Devices:**

Optical Devices: Photon Absorption Coefficient, Electron-Hole Pair Generation Rate, Solar Cells, The pn Junction Solar Cell, Conversion Efficiency and Solar Concentration, Photodetectors: Photodiode, PIN Photodiode, Avalanche Photodiode, Light Emitting Diodes, Laser Diodes.

The Tunnel Diode, The IMPATT Diode, The Gunn Diode, The p-n-p-n Diode, SCR, Nanoelectronics Devices.

**Text Books:**

1. Solid State Electronic Devices, 7<sup>th</sup> Edition, Ben. G. Streetman and Sanjay Banarjee, Pearson Education, New Delhi.
2. Semiconductor Physics and Devices, 4<sup>th</sup> Edition, Donald A. Neamen and Dhrubesh Biswas, Tata McGraw Hill Publishing Company Limited, New Delhi.

**Reference Books:**

1. Solid State Devices and Materials, R.K.Singh & D.S.Chauhan, Wiley India.
2. Fundamentals of Semiconductor Devices, M.K. Achuthan and K.N. Bhatt, Tata McGraw Hill Publishing Company Limited, New Delhi.
3. Principle of Semiconductor Devices, 2nd Edition, Sima Dimitrijevic, Oxford University Press, New Delhi.
4. Semiconductor Device Modeling With SPICE, 2nd Edition, Giuseppe Massobrio and Paolo Antognetti, Tata McGraw Hill Publishing Company Limited, New Delhi.
5. Physics of Semiconductor Devices, 3rd Edition, S.M. Sze and Kwok K. Ng, Wiley India Pvt. Limited, New Delhi.
6. Solid State Electronics Devices, D.K. Bhattacharya and Rajnish Sharma, Oxford University Press, New Delhi

## Minor Subject

### ANALOG ELECTRONICS CIRCUIT (3-0-2)

#### **MODULE – I**

**(12 Hours)**

**MOS Field-Effect Transistor:** Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E-MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch. (4 Hours)

**Biasing of BJTs:** Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples. (4 Hours)

**Biasing of FETs and MOSFETs:** Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

#### **MODULE – II**

**(12 Hours)**

**Small Signal Analysis of BJTs:** Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of  $R_S$  and  $R_L$  on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits. (6 Hours)

**Small Signal Analysis of FETs:** Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of  $R_{SIG}$  and  $R_L$  on CS Amplifier; Source Follower and Cascaded System. (6 Hours)

#### **MODULE – III**

**(5 hours)**

**High Frequency Response of FETs and BJTs:** High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier. (5 Hours)

#### **MODULE – IV (9 hours)**

**Feedback amplifier and Oscillators:** Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. (4 Hours)

**Operational Amplifier:** Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier. (5Hours)

#### **Additional Module (Terminal Examination-Internal)**

**(6 hours)**

Basic analysis of difference amplifier, Simulation of analog circuits i.e., different single and cascaded amplifier circuits, difference amplifier circuits and validating the theoretical parameters using PSpice and MULTISIM. Analysis op-amp IC circuits using LF411 and  $\mu A$  741, Signal Generators using OPAMP: Square, triangle and ramp generator circuits using opamps - Effect of slew rate on waveform generation-introduction to analog simulation OPAMP as nonlinear element: comparator, Voltage controlled oscillator (VCO). Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier

#### **Text Books**

1. Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9<sup>th</sup>/10<sup>th</sup> Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
2. Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2<sup>nd</sup> Edition,2008.

**Reference Books**

1. Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5<sup>th</sup> Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
2. Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition, (*For Problem Solving*)
3. Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition,2002.
4. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2<sup>nd</sup> Edition.2004.
5. Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
6. Electronic device and circuits, David A. Bell, Oxford University Press, 5<sup>th</sup>edition,2008.
7. Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009



## FASHION & APPAREL TECHNOLOGY

### **PCFT      ELEMENTS OF FASHION (3-0)**

#### **Module-I (12hrs)**

Origin of fashion, Origin of clothing, Fashion language, Philosophy of design, Nature of fashion .Elements of fashion, Terminology of fashion: style, design, taste, classic, fad. Component of fashion: Silhouette, Texture, Details. Study of leading fashion designers; French, Italian, American, Indian. Costumes of ancient civilization; Egypt, Roman, French. Fashion Trends

#### **Module-II (12 hrs)**

Principle of fashion. Environmental factor Demographic & Psychographics, Economic factors, Sociological factor, Psychological factor. Fashion influence & theories of fashion adoption. Movement of fashion, the cycle of fashion; stages of cycle. Factors influencing fashion movement (accelerating & retarding factors). Fashion prediction

#### **Module-III (12 hrs)**

Leaders of fashion, Birth of fashion; designers role, manufacturer's role, retailer's role, insight & intuition of sources of design. trade shows, fashion promotion and advertisement. Retailing: an overview on different types of retail store. Merchandising: role of a merchandiser, little idea about visual merchandising.

#### **Books Recommended:**

1. Inside Fashion Design -Kitty G.Dikerson
2. Inside Fashion Business -Kitty G. Dikerson
3. Elements of color & design –Sumathi G.J.

### **PCFT      SKETCHING & FASHION ILLUSTRATION LABORATORY(0-0-2)**

1. Human figure drawing with the help of blocks.
2. Sketching of different body parts (normal figures & fashion figures).
3. To learn & practice free-hand sketching techniques.
4. Sketch cloque figure with pencil in different postures.
5. To learn media & techniques for illustration: fashion figure with pencil shading, pencil / steedler color, wax crayons, water color & micro tip pen.
6. Kid's fashion: illustration of different types of kids wear.
7. Casual & formal wear illustration.
8. Adult fashion: Illustration of --- wedding wear, party wear, seasonal wear, sports wear, etc.....

**PCFT                      ELEMENTS OF DESIGN AND COLOUR (3-0)**

**Module-I ( 12 hours )**

**Elements of an Art and Principles of Design:**

Basic concept of Line, Direction, Shape, Size, Texture Value, Colour.Repetition, Alternation, Harmony, Gradation, Contrast, Dominance and subordination, Unity, Balance.

Study of different types of motifs: - Natural Motif, Decorative Motif, Geometric Motif, Abstract Motif.

**Module-II ( 12 hours )**

**Colour Theory :**

Definition of color theories, Light Theory of color, Chromatic Circle, Pigment Theory of Colour,

Colour Wheel, Colour schemes- triad, mono chromatic, achromatic, polychromatic, analogous,

Complementary Colour schemes .Attributes of Primary and Secondary Colours.

Psychological

effect of Colour; warm & cool colour. Rainbow colour

**Colour Modification and Colour Harmony:**

Modification of colour as a formation of tints, shades & colour greys .Change in Hue, Change in value, Neutralized Colour or coloured grey. Achromatic Harmony, Monochromatic Harmony, Analogues Harmony, Complementary Harmony, Polychromatic Harmony.

**Module-III ( 12 hours )**

Composition of designs Geometric ornamentation, conventional treatment of natural and artificial forms, adoption and reproduction of earlier designs. Construction of symmetrical figures, Reversing inclined figures.

Arrangement of figures - unit-repeating design, the drop device, drops reverse designs, sateen system of distribution (with reference to half drop, diamond base, ogee base, rectangular base lines). Construction of designs from incomplete repeat.

Application of Colour to woven and printed textiles. Factors influencing the Appearance and Ornamentation of Fabrics with reference to raw-material, weave and finish.

**Books Recommended:**

1. WATSONS Textile Design and Colour, Gosciki Z. J.
2. Inside Fashion Design, Sharon Lee Tats
3. Pattarn Design, Lewis F.day
4. Colour Harmony, Bride N. Whelan, Rockport Publishers.
5. The Costumes and Textiles of India, Jamila Brij Bhusan
6. Soamn, Jullian, 'Professional Fashion illustration' B.T. Batslord, London 1995
7. Drake, Nicholas, 'Fashion illustration today' Thamesis Hudson. London Publication

**PCFT BASIC DESIGN & COLOUR CONCEPT LABORATORY(0-0-2)**

1. To develop some design using basic concept of line, shape and texture through gradation, repetition, proportion and emphasis.
2. To develop design using different type of motifs (Natural Motif, Decorative Motif, Geometric Motif, Abstract Motif).
3. To produce floral, geometrical abstract and boarder design. Enlargement and deduction of design.
4. To develop Colour mixtures according to pigment theory of colour and show arrangement of the primary, secondary and intermediate Colour.
5. To develop Colour mixture according to light theory of Colour with primary, secondary and intermediate Colour.
6. To develop Colour modification using change in hue, change in value (tints and shades) and coloured grey.
7. To produce monochromatic contrast and to produce polychromatic contrast.
8. To study composition of design / motif using the followings:- All over unit repeat, half drop, diamond base, ogee base, sateen and wave line etc.
9. To produce at least five sketches by using different colour shades with own imagination.
10. Creation and manipulation of Colour using computers.

**PCFT FUNDAMENTAL OF TEXTILE – I (3-0)**

**Module I (16 hours)**

Objects of ginning, study of different ginning machines. Basic operations in the blow room section, Objects of Carding. Principles of carding & stripping actions .Study of different parts and function of a Carding Machine.Mechanical and Actual draft, Defects in carding.Objects of Drawing.Study of different parts and function of high speed Draw Frame Machine.Objects of Comber. Preparatory processes and mechanism of combing operation .Objects of Speed frame. Study of different parts and function of a modern speed frame machine. Principles of drafting, twisting and winding in speed frame.

**Module-II (12hours)**

Objects of Ring spinning, Study of different parts and function. Brief idea about rotor, air jet, friction spinning machines & Properties of those yarns. Study of different types of yarn: (ply, core spun, sewing thread, Slub, and melange yarn). Objects of warp and weft winding. Objective of warping, types of warping (Direct and Sectional types).Objects of sizing, sizing ingredients and their function, path of yarn in a sizing machine.

**Module-III (10hours)**

Basic concept & working principle of Shedding, Picking, & beat up mechanism.Shuttle checking.Objective & working principle of Take up motion. Basic concepts & working of the let off motion, Basic concepts of Warp protector mechanisms & warp stop motions.

Fancy Fabric Formation: Functions of Dobby, Types of Dobby, Function of Jacquard, Drop Box Mechanism, Different types of fabric defects their causes and remedies. Brief idea about Gripper, Rapiers, Air Jet and Water Jet Weaving Machines.Brief idea about plain and twill weave.

**Books Recommended:**

1. Manual Cotton Spinning-Vol.to 5, Textile Institute
2. A practical Guide to Opening & cleaning, W. Klien  
Draw frame, Speed frame & Comber, Ring Spinning ( All parts)
3. The Institute of Technology , Szaloski USE series on Textile Processing
4. Recent Advances in Spinning Technology, Salhotra
5. Spun Yarn Technology, Oxtoby
6. An introduction to Warping and Winding- Dr.M.K.Talukdar
7. Industrial Practice in Yarn Winding- NCUTE
8. Sizing : Material,Method & Machine – D.B.Ajgaonkar
9. Weaving Mechanism – N.N.Banerjee
10. Weaving Mechanism – Robinson & Marks
11. Modern Preparation and Weaving machine – A.Ormerod.

**PCFT**

**TEXTILE MANUFACTURING LABORATORY**

1. To study of the operation of the machines and process parameters in yarn manufacturing preparatory processes.
  - a) Blow Room
  - b) Carding
  - c) Draw frame
  - d) Comber
  - e) Speed frame.
2. To study of the operation of spinning machines and process parameters of Ring spinning.
3. To study of the operation of spinning machines and process parameters of Rotor spinning.
4. To study of operation of Ring doubler and TFO used for producing plied yarn.
5. To study of the operation of the machines and process parameters in fabric manufacturing preparatory processes.
  - a) Winding , b) Warping, c) Sizing, d)
6. To study the passage of yarn and different parts of a plain loom.
7. To learn the operational mechanism of a loom for producing woven fabric.
8. To practice and produce 1 meter plain and twill fabric using handloom/powerloom.
9. To learn the function of dobby and jacquard in a loom.
10. To learn constructional features of a shuttle less loom.

**PCFT TRADITIONAL TEXTILE (3-0)**

**Module-I**

History of western costumes. Greek and Persian influence on fashion.

French Costumes: French Costumes during renaissance 1400-1600

English costumes :English Costume during Middle Ages.

American costumes: American costumes from 18th to 20th centuries.

African and European traditional costumes, colour combination, designs, motifs and accessories.

**Module-II**

Traditional costumes of Asian countries – Japan, China, Srilanka, Pakistan, Afghanistan and

Thailand.

Indian costumes from the earliest times to the beginning of the historical period: Indus valley Civilization Costumes, Indo Aryans & Vedic Age, Mauryan & the Sunga Period, Satavahana Period, Kushan Period, Gupta Period, Mughal Period.

Traditional textile and their relation with, Religion, culture, climatic & socio economic conditions.

**Module-III**

Traditional Indian Textiles with the special reference of materials, colors, motifs and production processes – Ikat, Patola, Kalamkari, Chanderi, Kota, Brocades, Bandhani, Block Printed Textiles.

Indian Traditional Textiles with special reference to fabric, embroidery, threads, colors, stitches, and motifs - Chickankari – Lucknow, Phulkari – Punjab, Kanthas – Bengal, Applique work – Orissa and Gujarat.

**Recommended Books:**

1. "Historic Costumes" - Katherine Morris Cester, Prentice Hall 2000.
2. "Traditional Indian Textiles"- Fallow J and Bernard N Thomas and Hudson, Prentice Hall, India,
3. "Historical Fashion in detail the 17th and 18th Centuries" -Hart A North S V and A Museum, ,
  - a. McMillan, India, 1998.
4. "Traditional Textile Designs of India" - B.K. Behera, IIT, Delhi.
5. "The costumes and Textiles of India" - Jamila Brij Bhusan, Prentice Hall 2000
- 6.

**PCFT**

**Traditional Textile Laboratory(0-0-2)**

1. Study of Traditional Indian Textiles with the special reference of materials, colors, motifs and production processes -
  - a) Ikat and Patola
  - b) Kalamkari
  - c) Chanderi
  - d) Kota
  - e) Brocades
  - f) Bandhani
  - g) Block Printed Textiles

2. Study of Traditional Embroidery and Applique work with special reference to fabric, embroidery threads, colors, stitches, and motifs
  - a) Chickankari - Lucknow
  - b) Phulkari - Punjab
  - c) Kanthas - Bengal
  - d) Applique work – Orissa and Gujarat
3. Preparation of at least two samples with machine embroidery techniques

## **PCFT POLYMER CHEMISTRY & FIBER SCIENCE (3-1)**

### **Module-I ( 12 hours )**

Introduction to polymers, Classification of polymers, Chemistry of polymerization- condensation polymerization & addition polymerization, polymerization technique, bulk, solution, and emulsion polymerization with special reference to textile & clothing material. Molecular weight- weight average molecular, number average molecular weight, molecular weight and degree of polymerization, polydispersity and molecular weight, size of polymer molecule, geometrical structure of polymer molecules. Effect of molecular arrangement and molecular weight on properties of polymers/ fibers. Orientation and crystallinity in fibres. Effect of orientation and crystallinity on the physical and chemical properties of fibres. Concept of thermoplastic and thermoset material. Concept of rubbery state and rubber elasticity. Transition from glassy to rubbery state. Melting of polymers.

### **Module - II (12 hours )**

Classifications of Textile Fibers according to their nature and origin. Characteristics of good textile fiber, essential and desirable properties of apparel grade textile fibers & technical grade textile fibers

Natural Fibres :- (Vegetable fibres)

Cotton - Grading, morphological and chemical structure, physical and chemical properties and its applications.

Jute - Retting, Scutching, morphological and chemical structure , Physical & Chemical properties of jute fibre, applications of jute fibre.

Flax – Retting, Scutching, morphological and chemical structure, Physical & Chemical properties and applications.

Ramie, Leaf fiemp and pineapple fibres - Physical & Chemical properties and applications.

Natural Fibres :- (Protein Fibres )

Silk : Type of Silk fibers, Pre and post cocoon operation, Degumming, Reeling, morphological and chemical structure structure of silk fiber etc. Physical and chemical properties of the silk fiber.

Wool : Wool - types of wool, grading of wool, morphological and chemical structure structure of wool fiber, physical & chemical properties of wool fiber and its application.

**Module - III (12 hours)**

**Production Process of Man made fibers.**

Regenerated cellulosic base fibers: Out line of the manufacturing of viscose rayon, Polynosic, high weight modulus fiber, Cupramonium rayon, acetate and triacetate fiber,

Synthetic base Fiber: Out line of the manufacturing process of filament and Staple fiber with special reference to polyester, polyamide, polypropylene and acrylic fiber.

Basic principles and need for drawing and heat setting for synthetic fibers.

Brief outline of high-tech fibers like Kevlar, nomex, carbon, glass, etc.

Textured Yarn Technology :- Importance of texturing. Brief description about different processes in textured yarn technology.

**Books Recommended:**

1. Textile Fibre, V. A. Shenai
2. Introduction to Textile Fibres, H. V. Sreenivas Moorthy
3. Dyeing & Chemical Technology of Textile Fibres, E. R. Trotman
4. Introduction to textiles, M. Joseph
5. Fibre Science and Tecnology, S.P.Mishra
6. Polymer Chemistry, S.K Mishra
7. Polymer Chemistry by V.R Gowariker, Viswanathan and sreedhar
8. Manmade fiber Technology by V.A.Shenai
9. Production of Synthetic Fibres by A.A.Vaidya

**ENGINEERING ECONOMICS**

*Theory L/T (Hours per week):2/1, Credit: 3*

**Module I (12 hours)**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

**Module II (12 hours)**

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

#### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

Credit- 3

Class Hours - 40

#### Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.	10



- Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.
- Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).
- Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.
- 03 Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **9**
- Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.
- Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.
- 04 Organizational Culture :** Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality. **8**
- 05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. **7**
- Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

#### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

## **FASHION & APPAREL DESIGNING (4-0) (Honours Subject)**

### **Module-I (12 Hour)**

Introduction to fashion and apparel design. Introduction to Anatomy, study of bone and muscular structure, proportions of males, females and children. Study of face, torso, legs and arms.

Fashion Figure - study of various proportions, The balance line in drawing figures, gestures and movements. 8 head, 10 head, 12 head figures, Figure analysis, body types, designing for diverse body types and ages.

Component of fashion: Silhouette, Texture, Fashion. Four levels of Fashion (Primary level, Secondary level, the Retail level & Auxiliary level). Understanding the fashion cycle (The rise, peak decline and obsolete stage). Classification of silhouettes and different types of silhouettes.

### **Module-II (12 Hour)**

Origin of fashion and clothing theories, Clothing as modesty, protection, status and religious symbols. Levels of Fashion Acceptance-Fashion leader, fashion role model, fashion follower, Fashion victims. Fashion categories: Womens wear-size range, age, price, season, style, occasion Mens wear-history from 1900 to 1990s, current market trend Children's wear- selling seasons, common fibres, trims, size categories, Different kinds of trims and accessories used for apparel and their uses.

Structure of the fashion market (haute couture, designer wear, street fashion/mass market) Techniques of fashion promotion.

### **Module-III (16 Hour)**

Garment Features -types of silhouettes, collars, yoke variations, pockets, cuffs, sleeves  
Trousers, Fashion silhouettes - types of silhouettes, blouses formal, casual, and shirts - men and women. Skirts flared, pencil, circular, trousers, collars, cuts, yokes, pockets, cuffs as seen in illustration

Fashion Psychology, role of clothing in physical, social, psychological and cultural scenario, Human behaviour and clothing, Clothing and gender differentiation. Fashion designers, history and look into design concepts of famous designers, both Indian and International. Computer aided designing: Fashion sketching, colour matching and computer graphics. Folios: Creative, Dress, designer.

#### **Recommended Books:**

1. Inside Fashion Design -Kitty G. Dikerson
2. Inside Fashion Business -Kitty G. Dikerson
3. Elements of color & design -Sumathi G.J.
4. The Costumes and Textiles of India, Jamila Brij Bhusan
5. Dictionary of Costumes and Fashion: Historic and Modern, Mary Brooks Picken.

## **Basic concept of Fashion & Design(4-0) ( Minor Specilisation)**

### **Module-I (12 Hour)**

Introduction to Fashion: Fashion origin, evolution with examples from different eras till French revolution, Fashion cycles, Fashion theories.

Fashion terminology: fashion, style, fad, classic, boutique, trends, designer, silhouette, Hi fashion, Fashion/selling seasons and knock-offs.

Types of fashion: haute couture, Prêt-a-porter and Mass Fashion

Levels of Fashion Acceptance-Fashion leader, fashion role model, fashion follower, Fashion victims.

### **Module-II (12 Hour)**

Basic sketching techniques and sketching from life, Perspective and its uses, Grid technique of rendering

Introduction to Anatomy, study of bone and muscular structure, proportions of males, females and children. Study of face, torso, legs and arms Introduction to Fashion Art, Proportion and the Fashion Figure - 8 head, 10 head, 12 head theory of fashion drawing

Elements of Fashion illustration: Introduction to Fashion illustration - History, importance, artists and illustrators of national and international repute.

### **Module-III (16 Hour)**

Elements of Design (point, line, form, shape, space, size, texture and colour), Principles of Design (harmony, proportion, balance, rhythm and emphasis) Colour Theory (Prang, Munsell colour system, Pantone Colours, colour wheel, colour value scale, grey scale, colour schemes, colour psychology, colour and emotions, Indian approach to colour), Modification of colour as a formation of tints, shades & colour greys. Change in Hue, Change in value, Neutralized Colour or coloured grey. Achromatic Harmony, Monochromatic Harmony, Analogous Harmony, Complementary Harmony, Polychromatic Harmony.

### **Recommended Books:**

1. Inside Fashion Design, Sharon Lee Tats
2. Colour Harmony, Bride N. Whelan, Rockport Publishers.
3. The Costumes and Textiles of India, Jamila Brij Bhusan
4. Soamn, Jullian, 'Professional Fashion illustration' B.T. Batslord, London 1995 .
5. Drake, Nicholas, 'Fashion illustration today' Thamesis Hudson. London Publication

## MECHANICAL ENGINEERING

### **MECHANICS OF SOLID**

*Theory L/T (Hours per week): 3/0, Credit: 3*

#### **MODULE - I (10 Lectures)**

1. Concept of Stress:

Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members : Composite bars in tension and compression - temperature stresses in composite rods, Concept of Statically indeterminate problems. Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

2. Biaxial State of Stress :

Analysis of Biaxial Stress.Plane stress, Principal plane, Principal stress, Mohr's Circle for Biaxial Stress. Stresses in thin cylinders and thin spherical shells under internal pressure, wire winding of thin cylinders.

#### **MODULE - II (10 Lectures)**

3. . Biaxial State of Strain:

Two dimensional state of strain, Principal strains, Mohr's circle for strain, Calculation of principal stresses from principal strains, Strain Rossette.

4. Shear Force and Bending Moment Diagrams:

Shear force and bending moment. Types of load and Types of support. Support reactions, Relationship between bending moment and shear force, Point of inflection. Shear Force and Bending Moment diagrams.

5. Bending of Beams:

Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, Composite beams.

#### **MODULE - III (8 Lectures)**

6. Deflection of Beams :

Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

7. Theory of Columns:

Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio, Eccentric loading of short column

#### **MODULE - IV (8 Lectures)**

8. Torsion:

Torsion in solid and hollow circular shafts, Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Strength of shafts in combined bending and twisting, Close - Coiled helical springs.

**TEXT BOOKS**

1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East West Press
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Materials by R.Subramaniam, Oxford University Press

**REFERENCE BOOKS**

1. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
3. Mechanics of Materials by William F.Riley, Leroy D.Sturges and Don H.Morris, Wiley
  - a. Student Edition
4. Mechanics of Materials by James M. Gere, Thomson Learning
5. Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning
6. Strength of Materials by S.S.Rattan, Tata Mc Graw Hill
7. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India

**MECHANICS OF SOLID LABORATORY**

*Practical L/T/P (Hours per week): 0/0/2, Credit: 3*

**Laboratory Experiments (Minimum 8 experiments)**

1. Determination of tensile strength of materials by Universal Testing Machine
2. Determination of compressive strength of materials by Universal Testing Machine
3. Determination of bending strength of materials by Universal Testing Machine
4. Double shear test in Universal Testing Machine
5. Determination of Impact strength of material (Charpy and Izod)
6. Determination of Hardness strength of materials (Brinell, Rockwell and Vickers)
7. Determination of Rigidity modulus of material
8. Determination of Fatigue strength of material
9. Estimation of Spring Constant under Tension and Compression.
10. Load measurement using Load indicator, Load Cells.
11. Strain measurement using Strain Gauge.
12. Stress measurement using strain rosette.

## INTRODUCTION TO PHYSICAL METALLURGY AND ENGINEERING MATERIALS

*Theory L/T (Hours per week): 3/0, Credit: 3*

### MODULE-I (08 Lectures)

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

### MODULE-II (08 Lectures)

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystallization and grain growth; hot working.

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

### MODULE-III (10 Lectures)

Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d) Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel.

T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

### MODULE-IV (10 Lectures)

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic:- Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Fibre reinforced plastics, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

#### Text Books:

1. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
2. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.
3. Physical Metallurgy: Principles and Practice by Ragahvan, PHI

**Reference Books**

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
2. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
3. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
4. Elements of Materials Science & Engineering by Van Vlack, Pearson
5. Mechanical Metallurgy by Dieter, Tata MacGraw Hill
6. Composite Material science and Engineering by K. K. Chawla, Springer
7. Material Science and Metallurgy, by U. C. Jindal, Pearson

**FLUID MECHANICS AND HYDRAULIC MACHINES**

*Theory L/T (Hours per week): 3/0, Credit: 3*

**Module I (12 Lectures)**

**Introduction:** Scope of fluid mechanics and its development as a science

Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

**Fluid statics:** Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

**Module II (14 Lectures)**

**Fluid kinematics:** Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,

Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

**Fluid dynamics :** Introduction, Introduction to N-S equation, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube.

Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

**Module III (8 Lectures)**

**Hydraulic turbines:** Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine.

Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.

**Reaction Turbines:** Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation

**Module IV (06 Lectures)**

**Centrifugal Pump:** constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

**Positive displacement pumps:** Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

**Text Books**

1. Fluid Mechanics, Y A Cengel, TMH
2. Fluid Mechanics and Hydraulic Machines, Modi & Seth
3. Fluid Mechanics, A.K. Mohanty, PHI
4. Fluid Mechanics and Machinery, Mohd. Kareem Khan, OXFORD

**Reference Books:**

1. Fluid Mechanics and Machinery, CSP Ojha and P.N. Chandramouli, Oxford University Press
2. Fluid Mechanics and Fluid Machines by A.K.Jain, Khanna Publishers
3. Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, TMH
4. Introduction to Fluid Mechanics, Fox, McDonald, Willey Publications
5. Fluid Mechanics by Kundu, Elsevier
6. An Introduction to Fluid Dynamics, G.K.Batchelor, Cambridge University Press
7. Engineering Fluid Mechanics by Garde et. al., Scitech
8. First course in Fluid Mechanics by Narasimhan, University press
9. Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson Education
10. Fluid Mechanics and Machines, Sukumar Pati, TMH

***Practical (Hours per week): 2, Credit: 1***

**Laboratory Exp[eriments (Minimum 8 experiments)**

1. Determination of Metacentric Height and application to stability of floating bodies.
2. Determination of  $C_v$  and  $C_d$  of Orifices.
3. Experiments on impact of Jets
4. Experiments on performance of Pelton Turbine
5. Experiments on performance of Francis Turbine
6. Experiments on performance of Kaplan Turbine
7. Experiments on performance of centrifugal pump
8. Experiments on performance of reciprocating pump
9. Experiments on Reynold's Apparatus
10. 12 Experiments on Flow through pipes
11. Experiments on performance of Gear pump
12. Verifications of momentum equation



## **ENGINEERING THERMODYNAMICS**

*Theory L/T (Hours per week): 3/0, Credit: 3*

### **Module-I (10 Lectures)**

1. Review of First and Second laws:

First law analysis of unsteady flow control volumes, Entropy generation, Entropy balance for closed systems and steady flow systems, Available energy, Quality of energy, Availability for non flow and flow process, Irreversibility, Exergy balance, Second law efficiency.

### **Module- II (12 Lectures)**

2. Vapour Power Cycles:

The Carnot vapor cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle, Cogeneration (Back pressure and Pass-out turbines), Combined-cycle power generation systems, Binary vapour cycles.

3. Gas Power Cycles:

Air standard cycles- Otto, Diesel, Dual Combustion and Brayton cycles, The Brayton cycle with non-isentropic flow in compressors and turbines, The Brayton cycle with regeneration, reheating and intercooling, Ideal jet propulsion cycles.

### **Module- III (12 Lectures)**

4. Refrigeration cycles:

Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), The vapor compression cycle, The vapor absorption cycle.

5. General Thermodynamic property relations:

The Maxwell relations, The Clapeyron equation, The TdS relations, Isothermal compressibility and volume expansivity, The Joule-Thomson coefficient.

### **Module- IV (06 Lectures)**

6. Reciprocating Air Compressors:

Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors.

### **Text Books**

1. Engineering Thermodynamics by P. K. Nag, Publisher:TMH
2. Engineering Thermodynamics by P. Chattopadhyay, OXFORD
3. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons
4. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI

### Reference

1. Engineering Thermodynamics by M.Achyuthan, PHI
2. Engineering Thermodynamics by Y.V.C. Rao, University Press
3. Thermodynamics and Thermal Engineering by Kothandaraman & Domkundwar, Dhanpat Rai
4. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers
5. Steam Tables in SI Units by Ramalingam, Scitech
6. Steam Tables by C.P.Kothandaraman, New Age International

***Practical (Hours per week): 2, Credit: 1***

### Laboratory Experiments: (Minimum 8 experiments)

1. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
2. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.
3. Study of steam power plant.
4. Study of refrigeration system.
5. Study of gas turbine power plant.
6. Performance analysis of reciprocating air-compressor.
7. Performance analysis of Centrifugal / Axial Flow compressor.
8. Determination of performance characteristics of gear pump.
9. Measurement of steam quality using calorimeter
10. Verification of Joule-Thomson coefficient.

## KINEMATICS AND DYNAMICS OF MACHINES

***Theory L/T (Hours per week): 3/1, Credit: 4***

### Module – I : (10 Lectures)

**1. Kinematic fundamental:** Basic Kinematic concepts and definitions, Degrees of freedom, Elementary Mechanism : Link, joint, Kinematic Pair, Classification of kinematic pairs, Kinematic chain and mechanism, Grüebler's criterion, Inversion of mechanism, Grashof criteria, Four bar linkage and their inversions, Single slider crank mechanism, Double slider crank mechanism and their inversion. Transmission angle and toggle position, Mechanical advantage.

**2. Kinematic Analysis :** Graphical analysis of position, velocity and acceleration of four bar and Slider crank mechanisms. Instantaneous centre method, Aronhold-Kennedy Theorem, Rubbing velocity at a Pin-joint. Coriolis component of acceleration.

**Module - II : (10 Lectures)**

**3. Mechanism Synthesis :** Graphical methods of synthesis, Chebychev spacing for precision positions, Freudenstein's equation applicable to four bar linkages.

**4. Mechanism Trains:** Gear Terminology and definitions, Analysis of mechanism Trains: Simple Train, Compound train, Reverted train, Epicyclic train and their applications.

**Module - III : (8 Lectures)**

**5. Combined Static and Inertia Force Analysis:** Inertia forces analysis, velocity and acceleration of slider crank mechanism by analytical method, engine force analysis - piston effort, force acting along the connecting rod, crank effort. dynamically equivalent system, compound pendulum, correction couple.

**6. Friction Effects:** Screw jack, friction between pivot and collars, single, multi-plate and cone clutches, anti friction bearing, film friction, friction circle, friction axis,

**Module - IV : (8 Lectures)**

**7. Flexible Mechanical Elements:** Belt, rope and chain drives, initial tension, effect of centrifugal tension on power transmission, maximum power transmission capacity, belt creep and slip.

**8. Brakes & Dynamometers :** Classification of brakes, Analysis of simple block, Band and internal expanding shoe brake, Braking of a vehicle. Absorption and transmission dynamometers, Prony brake, Rope brake dynamometer, belt transmission, epicyclic train, torsion dynamometer.

**Text Books**

1. Kinematics and Dynamics of Machinery by R L Norton, Tata MacGraw Hill
2. Theory of Machines and Mechanisms by John J. Uicker Jr., Gordon R. Pennock and Joseph E. Shigley, Oxford University Press
3. Theory of Machines by S.S.Rattan, Tata MacGraw Hill

**Reference**

1. Theory of Machines by Thomas Bevan, CBS Publications
2. Kinematics and Dynamics of Machinery by Charles E. Wilson and J.Peter Saddler, Pearson Education
3. Mechanism and Machine Theory by J.S.Rao and R.V.Dukipatti, New Age International.
4. Theory of Mechanisms and Machines by A. Ghosh & A. K. Mallick, East West Press.
5. Kinematics and Dynamics of Machines by G.H. Martin, McGraw-Hill.
6. Theory of Machines and Mechanisms by P.L.Ballaney, Khanna Publishers
7. Theory of Mechanisms and Machines by C.S.Sharma and K.Purohit, PHI.

***Practical (Hours per week): 2, Credit: 1***

**Laboratory Experiments: (Minimum 8 experiments)**

1. Design of any one working model related to Kinematics of Mechanisms i.e., Module I and II.
2. Design of any one working model related to Dynamics of Machinery i.e., Module III and IV.
3. Radius of gyration of compound pendulum
4. Radius of gyration of connecting rod
5. TRI –FILAR / BI-FILAR System
6. Experiment on Screw Jack
7. Experiment on Journal Bearing Apparatus
8. Experiment/Study on clutches
9. Experiment on Epicyclic Gear Train
10. Experiments on Simple/Compound/Reverted Gear trains
11. Experiment on Dynamometer
12. Experiment on Brake
13. Experiment on Coriolis component of acceleration

**ENGINEERING ECONOMICS**

***Theory L/T (Hours per week):2/1, Credit: 3***

**Module I (12 hours)**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

**Module II (12 hours)**

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

#### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

**Credit- 3      Class Hours - 40**

#### Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
<b>01</b>	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	<b>6</b>
<b>02</b>	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality	<b>10</b>

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model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

**Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

**Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

**03 Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **9**

**Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

**Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

**04 Organizational Culture :** Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality. **8**

**05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. **7**  
Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

**HONOURS ELECTIVE**

**APPLIED MATHEMATICS (L/T: 4/0, Credit: 4)**

**Module-I (15 Hours)**

**Probability:**

Probability, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson, and Hyper-geometric distributions, Normal and exponential distribution, Distribution of several random variables.

**Statistics:**

Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis, Acceptance sampling, Regression Analysis, Fitting Straight Lines, Correlation analysis

**Module-II (15 Hours)**

**Partial Differential Equation:**

Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge's method, Second order partial differential equation

The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates.

**Module-III (08 Hours)**

**Complex Analysis:**

Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

**Module-IV (06 hours)**

Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method, evaluation of real integrals.

**Text books:**

1. E. Kreyszig, "Advanced Engineering Mathematics", Eighth Edition, Wiley India
2. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill

**Reference books:**

1. E.B. Saff, A.D. Snider, "Fundamental of Complex Analysis", Third Edition, Pearson
2. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd
3. P. V.O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi
4. Mathematical Methods by Potter Goldberg Publisher: PHI

**MINOR SPECIALIZATION**  
**APPLIED THERMAL ENGINEERING**  
*Theory L/T (Hours per week): 4/0, Credit: 4*

**Module-I ( 8 Lectures)**

1. **Review of First and Second laws:**

First law analysis of unsteady flow control volumes, Entropy change for different process, Entropy generation, Entropy balance for closed systems and steady flow systems, Available energy, Quality of energy, Availability for non flow and flow process, Irreversibility, Second law efficiency.

**Module - II (8 Lectures)**

2. **Air Standard Cycle & Introduction to I.C. Engine:** Otto, diesel and dual cycles, description and operation of four and two stroke cycle engine, comparison of SI and CI engines, valve timing diagram, power output and efficiency calculation. Brayton cycle, Gas turbine, Jet engines.

3. **Reciprocating Air Compressors:** Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors

**Module - III (12 Lectures)**

1. **Steam and Steam Generator:-** Properties of steam, measurement of dryness fraction, use of steam table and Mollier chart. T-S and H-S diagrams for representing thermodynamic processes. Boiler, Classification of boiler, comparison between water tube boiler and fire tube boiler. Boiler mountings and accessories. Description of Cochran & Babcock -Wilcox boiler.

2. **Steam Nozzles:-** Types of nozzles, isentropic flow through nozzles, effect of friction on nozzle efficiency. Critical pressure ratio and maximum discharge, throat and exit area.

**Module - IV (14 Lectures)**

3. **Steam Turbines & Condensers:-** Turbine type and applications. Impulse turbine, pressure and velocity compounding, velocity diagram, work output, losses and efficiency. Impulse reaction turbine, velocity diagram, degree of reaction, work



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output, losses and efficiency. Jet and surface condensers. Condenser vacuum and vacuum efficiency.

4. **Heat Transfer:** Basic modes of heat transfer, one dimensional steady state, conduction through slab, cylinder and sphere ; basic theory of radiant heat transfer, black body & mono chromatic radiation, total emissive power, heat exchangers.
5. **Refrigeration system:** Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), The vapor compression cycle, The vapor absorption cycle, air conditioning.

### Text Books

1. Engineering Thermodynamics by P. Chattopadhyay, OXFORD
2. Power plant Engineering by P. K. Nag, Publisher:TMH
3. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers.

### Reference

1. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons
2. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI
3. Engineering Thermodynamics by M. Achyuthan, PHI
4. Engineering Thermodynamics by Y.V.C. Rao, University Press
5. Thermodynamics and Thermal Engineering by Kothandaraman & Domkundwar, Dhanpat Rai
6. Steam Tables in SI Units by Ramalingam, Scitech
7. Steam Tables by C.P.Kothandaraman, New Age International

## METALLURGICAL AND MATERIALS ENGINEERING

### **SCIENCE AND ENGINEERING OF MATERIALS(3-0-2)**

#### **Module-I**

**Bonding in Solids:** Ionic, Covalent, and Metallic bonding, bonding forces and energy, secondary bonding.

**Crystal Structure:** Space lattices and Bravais lattices, Miller Indices of planes and directions, slip planes and slip directions, stereographic projections.

**Selected crystal structures:** Pure metals, Diamond and Graphite, coordination in ionic crystals, AB type compounds, Silica, Alumina, Complex Oxides, Silicates. Inorganic glass: Network structure in glasses. Polymeric structures: Thermo plastics, Elastomers, Thermosets, crystallinity in polymers.

#### **Module-II**

**Principles of Alloy theory:** Primary substitutional solid solution, Interstitial solid solution, types of intermediate phases, Ordered-Disordered phenomena. Hume Rothery Rules, Intermetallic compounds, Normal valency compounds, Electron compounds, Interstitial compounds.

**Imperfections:** Point defects, Vacancies, Interstitialcies, Dislocations; Edge & Screw dislocations; Burgers vector. Crystallization from the melt:

Freezing of a pure metal, plane front and dendritic solidification at a cooled surface, formation of cast structure, gas porosity and segregation, directional solidification.

#### **Module-III**

**Binary Phase Diagrams:** Isomorphous, Eutectic, Peritectic, Eutectoid, Monotectic and Syntectic systems, Phase rule and Lever rule. Iron-Cementite Equilibrium diagrams and its applications, Plain carbon and alloy steel, Industrial applications of steels.

**Diffusion:** Fick's First and Second law of diffusion, Atomic model of diffusion, Grain boundary, surface and thermal diffusion, Kirkendall Effect, Interstitial diffusion.

**Nucleation:** Homogeneous and Heterogeneous nucleation, Kinetics of nucleation, Growth and overall transformation kinetics.

#### **Books for reference:**

1. V. Raghavan, Materials Science and Engineering, Prentice-Hall of India Private Limited, 2003.
2. W. F. Smith, Mc Graw Hill, Principles of Materials Science and Engineering, New York, 1994.
3. R. E Reid Hill, Physical Metallurgy Principles, PWS-Kent Publishing, 2004.
4. Vijendra Singh, Physical Metallurgy, Standard Publisher, 2008.
5. C. Daniel Yesudian and D.G. Harris Samuel, Scitech Publication, India-2010
6. W. D. Callister, Materials Science & Engineering, An Introduction, John Wiley & Sons, 2007.
7. L. H. Van Vlack, Addison Wisley, Elements of Materials Science and Engineering, New York, 1985.
8. M.S. Vijaya and G. Rangarajan Mc Graw Hill Education (India)-2014

## SCIENCE AND ENGINEERING OF MATERIALS

### **(Practical)**

#### **Suggested experiments:**

1. Preparation of metallurgical sample for microscopic observation.
2. Study of Metallurgical Microscope and familiarity with its components.
3. Determination of cooling curves of pure metals like Pb, Zn and Sn. Also acquaintance to differential cooling curves.
4. Microstructure of pure metals.
5. Microstructure of isomorphous alloys belonging to Cu-Zn, Cu-Sn and Cu-Ni systems.
6. Effect of cold working on hardness and microstructures of metals like Cu.
7. Recrystallisation and grain growth in cold worked and annealed Cu.
8. Microstructure of plain carbon annealed steels with variation in carbon content (Hypoeutectic, eutectic, Hypereutectic)

## METALLURGICAL THERMODYNAMICS & KINETICS(3-0-2)

### **Module I (15 Hours)**

Importance of Thermodynamics, definition of thermodynamic terms; concept of states, simple equilibrium. Equation of states, extensive and intensive properties, homogeneous and heterogeneous systems. Phase diagram of a single component system. Internal energy, heat capacity, enthalpy, isothermal, and adiabatic processes.

Second law of thermodynamics, entropy, degree of reversibility and irreversibility, criteria of equilibrium, auxiliary functions, combined statements, Maxwell's relations, transformation formula, Gibbs-Helmoltz equation.

Concept of Third law of thermodynamics, temperature dependence of entropy, statistical interpretation of entropy, Debye and Einstein concept of heat capacity, relation between  $C_p$  and  $C_v$ , consequences of third law.

### **Module II (13 Hours)**

Fugacity, activity, equilibrium constant, use of S-functions, controlled atmospheres, homogeneous and heterogeneous equilibrium.

Ellingham – Richardson diagrams, phase stability diagrams.

Solutions: partial molal quantities, ideal and non-ideal solutions, Henry's law, Gibbs – Duhem equation, regular solution, quasi-chemical approach to solution, statistical treatment. One weight percentage standard state, chemical potential, phase relations and phase rule – its applications.

### **Module III (15 Hours)**

Free energy – composition diagrams for binary alloy systems, determination of liquidus, solidus and solvus lines. Effect of pressure on phase transformation and phase equilibria.

Thermodynamics of electrochemical cells, solid electrolytes. Thermodynamics of point defects in solids.

Introduction to metallurgical kinetics: heterogeneous reaction kinetics: gas-solid, solid – liquid, liquid – liquid and solid-solid systems. Empirical and semi-empirical kinetics, concept of Johnson – Mehl equation, Thermal analysis.

## References

1. Introduction to the Thermodynamics of Materials by D.R.Gaskell; Taylor and Francis.
2. Physical Chemistry of Metals by L.S.Darken & R.W. Gurry; McGraw Hill Book Company Inc.
3. Problems in Applied Thermodynamics by C. Bodsworth & A.S. Appleton; Longmans, Green and Co. Ltd.
4. Principles of Metallurgical Thermodynamics by S.K.Bose and S.K.Roy; University Press-IIM
5. Introduction to Metallurgical Thermodynamics by R.H.Tupkary; tu publishers, Nagpur.
6. Problems in Metallurgical Thermodynamics & Kinetics by G.S. Upadhyay & R.K.Dube; Pergamon Press.
7. Chemical and Metallurgical Thermodynamics – Part I & II by M.L.Kapoor.
8. Kinetics of Metallurgical Reactions by H.S.Ray; Oxford and IBH Publishing Co.
9. Textbook of Materials and Metallurgical Thermodynamics by A. Ghosh; Prentice Hall of India Pvt. Ltd.

## METALLURGICAL THERMODYNAMICS & KINETICS

### **(Practical)**

#### **Suggested experiments:**

1. Isothermal Kinetic study of limestone decomposition.
2. Devolatilization kinetics of Coal.
3. Oxidation of Copper.
4. To study the decomposition of calcium carbonate and determination of equilibrium constant and free energy change.
5. To determine the partial molal volume of each component in a solution of water and ethanol.
6. To study the effect of temperature on % reduction of iron ore pellet.
7. To study the effect of time on % reduction of iron ore pellet
8. Pelletization of iron ore fines, firing of pellets and measurement of their crushing strengths.
9. Dilatometric study of given Al plate sample
10. Thermal analysis of 0. 2% C steel using DSC – TG technique to study Microstructural changes with temperature
- 11.

## **TRANSPORT PHENOMENA(3-0-2)**

### **Module I (14 hours)**

Classification of fluids, ideal & real, Newtonian & Non-Newtonian, Newton's law of viscosity. Types of fluid flow – streamline & turbulent, continuity equation for incompressible and compressible fluid and its application. Concept of velocity bounds layer; Bernoulli's equation and its application for flow measurement by venturimeter, orifice meter, pilot tube and rotameter. Dimensional analysis by Rayleigh's method of indices and Buckingham's  $\pi$  theorem. Example of analysis of pressure gradient, mass transfer co-efficient & convective heat transfer co-efficient, concept of similarly and dimensionless criteria. Dimensionless groups & their significance. Pressure drop & friction factor in various configurations, flow in packed bed & fluidized bed. Free and partially restricted jets, high velocity fluid jets.

**Module II (14 hours)**

Heat Transfer: Internal & External modes of heat transfer, steady state heat conduction in monolayer and composite flat walls & cylinders. Unsteady state heat conduction, thin & massive body heating & cooling. Finite difference method in solving unsteady state heat conduction. Natural and forced convection, concept of heat transfer co-efficient, thermal boundary layers, some examples of connective co-relations. Law of radiation – Steffan-Boltzmann's law, Kirchoff's law & Lambarth's law, Black & grey body concepts, view factor, Radiation from flames & gases. Radiation between simple surfaces with & without absorbing gas media. Radiation shields. Overall Heat transfer co-efficient.

**Module III (12 hours)**

Mass transfer: Mass Transfer: Law of diffusion and their application, concept of mass transfer co-efficient & concentration boundary layer, Interfacial mass transfer, overall mass balance.

**Books for Reference:-**

1. Transport Phenomena by R. B. Bird, W. E. Stewart and E. N. Lightfoot, Wiley, 1960
2. Transport Phenomena in Metallurgy by G. H. Geiger and D. R. Poirier, Addison-Wesley, 1973.
3. Rate Phenomena in Process Metallurgy by J. Szekely and N. J. Themelis
4. Rate Processes in Metallurgy by A. K. Mohanty, PHI
5. J. R. Welty, R. E. Wilson and C. E. Wicks, Fundamentals of Momentum Heat and Mass Transfer, Wiley, 1976.

**TRANSPORT PHENOMENA**

**(Practical)**

**Suggested experiments:**

1. To find thermal conductivity of composite wall.
2. To find overall heat transfer coefficient in counter flow heat exchanger/parallel flow heat exchanger.
3. To determine the mass transfer coefficient for the given system using experimental set up.
4. To verify the flow whether it is laminar or turbulent.
5. To find out the pressure drop (flow through pipes).
6. To determine minimum fluidisation velocity and pressure drop.
7. To find out the pressure drop when a fluid is flowing through a packed bed.
8. To find out the flow rate of fluid flowing inside a pipe by using venturi meter.
9. To find out the flow rate of fluid flowing inside a pipe by using orifice meter.
10. To verify the Bernoulli's equation by using Bernoulli's apparatus.

## MATERIALS PROCESSING

### Module I (16 hours)

Introduction to metal casting, Moulding methods, materials and processes, with special reference to patterns, sand and binders. Solidification of short & long freezing range alloy castings, Gating and Riser of castings. Melting practices for ferrous and non-ferrous alloys- Cupola, rotary furnace, induction furnace, crucible furnace melting. Casting defects and remedy. Special casting processes.

### Module II (13 hours)

Introduction to metal joining processes. Theory and classification of welding processes. Metallurgical principles involved in welding of carbon and alloy steels and important nonferrous alloys. Welding defects and their remedies.

### Module III (13 hours)

Basic processes in Powder Metallurgy, Characteristics of powders. Compaction in rigid dies. Sintering of metal powders. Application of powder metallurgy products-their relative advantages.

### Books for reference:

1. Casting by J. Campbell, Butterworth - Haneman, London, 1993
2. Solidification Processing by M.C. Flemings, McGraw Hills, 1974.
3. Principles of Metal Casting by Heine, Loper, Rosenthal,.
4. Welding by Little, TMH.
5. Welding by A.C. Davies, Cambridge University Press.
6. Metallurgy of Welding, Brazing and Soldering by J.F.Lancaster.
7. Metallurgy of Welding by Sefarin, John Wiley.
8. Welding Hand Book, Vol-I &II.
9. Introduction to Powder Metallurgy by F.V.Lenel
10. Powder Metallurgy Science by R.M.German
11. Treatise on Powder Metallurgy by Goetzel, Vol-I&II
12. Powder Metallurgy by R.Lsande & C.R.S.Shakespere
13. Powder Metallurgy by A.K.Sinha, Dhanpat Rai
14. Powder Metallurgy, ASM Metals Handbook Vol-7

## MATERIALS PROCESSING (3-0-2)

### Suggested experiments:

1. Examination of the various zones of the arc in arc welding process.
2. Effect of increasing amperage on the quality of weld bead.
3. Microstructural investigation of the welded and heat affected zones.
4. Brazing of steel/ cast iron and observation of the relevant joined microstructures.
5. Preparation of standard samples for common sand testing.
6. Measurement of green compression strength, permeability and moisture content in the moulding sand.
7. Determination of compressive strength in sodium silicate/CO<sub>2</sub> mould as a function of gassing time and pressure.
8. Determination of the tensile strength of oil/resin bonded core sand.
9. Experiments on mechanical working processes like rolling, forging, extrusion, wire drawing, forming.

## PRINCIPLES OF EXTRACTIVE METALLURGY (3-1-0)

### Module I (14 hours)

**Unit processes in Pyrometallurgy:** Calcination and roasting, sintering, smelting, converting, reduction, smelting-reduction, metallothermic and hydrogen reduction; distillation and other physical and chemical refining methods: Fire refining, Zone refining, Liquation and Cupellation. Small problems related to pyro metallurgy.

### Module II (14 hours)

**Unit processes in Hydrometallurgy:** Leaching practice: In situ leaching, Dump and heap leaching, Percolation leaching, Agitation leaching, Purification of leach liquor, Kinetics of Leaching; Bio-leaching: Recovery of metals from Leach liquor by Solvent Extraction, Ion-exchange, Precipitation and Cementation process. Importance of potential-pH diagram. Some process flow sheet: recovery of Au from leach liquors, recovery of Nickel and Cobalt

Small problems relate to hydrometallurgy

### Module III (12 hours)

**Unit Process in Electrometallurgy:** Faraday's Laws of Electrolysis, concept of overvoltage, limiting current density, total cell voltage, series and parallel electrical circuits in refining, aqueous and fused salt electrolysis, electro refining of common metals like Cu, Zn, Au, Ni, Al, Mg etc. Electroplating

Small related problems to Electrometallurgy

### Books for Reference:

1. Principles of Extractive Metallurgy by T. Rosenqvist.
2. Principles of Extractive Metallurgy by Ahindra Ghosh and H. S. Ray.
3. Unit Processes of Extractive Metallurgy by R. D. Pehlke.
4. Fundamentals of Metallurgical Processes by L. Coudurier, D. W. Hopkins and I. Wilkomirsky.
5. Metallurgical Problems by A. Butts.
6. Electrochemical Engineering by C. L. Mantell.
7. Principles of Mineral Dressing by A. M. Gaudin.
8. Text Book of Ore Dressing by R. H. Richards and C. E. Locks.
9. Element of Ore Dressing by A.E. Taggart.
10. Handbook of Mineral Dressing- Ores and Industrial Minerals by A.E. Taggart.
11. Textbook of Ore Dressing by S.J. Trusscott.
12. Ore Dressing by S.K. Jain.
13. Mineral Processing Technology by Berry A Willis.

## ENGINEERING ECONOMICS

*L/T (Hours per week):2/1, Credit: 3*

### Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH



## ORGANIZATIONAL BEHAVIOUR

**Credit- 3      Class Hours - 40**

### Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
<b>01</b>	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	<b>6</b>
<b>02</b>	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. <b>Perception:</b> Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). <b>Motivation:</b> Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	<b>10</b>
<b>03</b>	<b>Foundations of Group Behavior:</b> The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. <b>Managing Teams:</b> Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. <b>Leadership:</b> Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders.	<b>9</b>
<b>04</b>	<b>Organizational Culture :</b> Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	<b>8</b>

- 05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. **7**

Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

#### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

### **PHYSICS OF MATERIALS (HONOURS)(4-0-0)**

#### **Module I (13Hours)**

Crystallography: Crystalline and amorphous structures, Elements of crystal symmetry, symmetry elements and axes, two, three, four and six fold symmetry, review of atomic bonding. Order-disorder transformations: Ordering, Degrees of long range and short range ordering, Anti phase domain, super lattice, Elements of superlattice theories, properties and applications.

#### **Module II (13 Hours)**

Electron theory of Metals: Heisenberg's uncertainty principle, Schrodinger's equation, free electron theory, Zone theory, Density of states, Fermi energy level, Application of zone theory to alloy phases; Conductors and insulators, semi conductors, P- and N- type semi conductors. Optical properties, Refraction, Absorption, Absorption in dielectrics, photographic images, Luminescence, Lasers.

#### **Module III (14 Hours)**

Magnetic Properties: Dia, Para and Ferro- magnetism, Domain theory of Ferro magnetism, Antiferromagnetism and Ferrites, Hysteresis loop, soft magnetic materials, Hard magnetic Materials, Superconductivity, BCS theory, Type- I and Type- II super conductors. Thermoelectric properties of metals and semiconductors, ionic and superionic conductivity in solids. Different types of dielectric materials, ferro, antiferro and ferri-electric materials. Piezo electric materials.

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

### **Books for Reference:**

1. Reed Hill R.E., Physical Metallurgy Principles, Affiliated East West.
2. Kakani S.L. and Kakani A., Materials Science, New Age International.
3. Higgins R.A., Engineering Metallurgy, Standard Publishers.
4. Raghavan V., Materials Science and Engineering, PHI.
5. Mauraka S.P. and Peckrar M.C., Electronic Materials Science and Technology, Academic Press.
6. Rose-innes A.C. and Rhoderick E.H., Introduction to Superconductivity, Pergamon press, Oxford.
7. Srivastava C.M. and Srinivasan C., Science of Engineering Materials, New Age Pub., New Delhi.
8. Kittel C., Introduction to Solid State Physics, John Wiley.
9. Streetman B.G., Solid State Electronic Devices, Prentice Hall, New Delhi.
10. Goldman A., Van Nostrand, Modern Ferrite Technology, New York.

## **PRINCIPLES OF EXTRACTIVE METALLURGY (3-1-0)(MINOR SUBJECT)**

### **Module I (14 hours)**

**Unit processes in Pyrometallurgy:** Calcination and roasting, sintering, smelting, converting, reduction, smelting-reduction, metallothermic and hydrogen reduction; distillation and other physical and chemical refining methods: Fire refining, Zone refining, Liquefaction and Cupellation. Small problems related to pyrometallurgy.

### **Module II (14 hours)**

**Unit processes in Hydrometallurgy:** Leaching practice: In situ leaching, Dump and heap leaching, Percolation leaching, Agitation leaching, Purification of leach liquor, Kinetics of Leaching; Bio-leaching: Recovery of metals from Leach liquor by Solvent Extraction, Ion-exchange, Precipitation and Cementation process. Importance of potential-pH diagram. Some process flow sheet: recovery of Au from leach liquors, recovery of Nickel and Cobalt

Small problems relate to hydrometallurgy

### **Module III (12 hours)**

**Unit Process in Electrometallurgy:** Faraday's Laws of Electrolysis, concept of overvoltage, limiting current density, total cell voltage, series and parallel electrical circuits in refining, aqueous and fused salt electrolysis, electro refining of common metals like Cu, Zn, Au, Ni, Al, Mg etc. Electroplating

Small related problems to Electrometallurgy

### **Books for Reference:**

1. Principles of Extractive Metallurgy by T. Rosenqvist.
2. Principles of Extractive Metallurgy by Ahindra Ghosh and H. S. Ray.
3. Unit Processes of Extractive Metallurgy by R. D. Pehlke.
4. Fundamentals of Metallurgical Processes by L. Coudurier, D. W. Hopkins and I. Wilkomirsky.
5. Metallurgical Problems by A. Butts.
6. Electrochemical Engineering by C. L. Mantell.
7. Principles of Mineral Dressing by A. M. Gaudin.
8. Text Book of Ore Dressing by R. H. Richards and C. E. Locks.
9. Element of Ore Dressing by A.E. Taggart.
10. Handbook of Mineral Dressing- Ores and Industrial Minerals by A.E. Taggart.
11. Textbook of Ore Dressing by S.J. Trusscott.
12. Ore Dressing by S.K. Jain.
13. Mineral Processing Technology by Berry A Willis.

## MINERAL ENGINEERING

### **INTRODUCTION TO MINERAL PROCESSING (3-0-2)**

#### **Module I (10 hours)**

Definition of Minerals And Ore, Economics of mineral processing, grade-recovery curve, Liberation, degree of Liberation.

#### **Module II (10 hours)**

Important Unit operations-Comminution, physical separation, magnetic and electrostatic separation, chemical separation processes, mass balances(Two and three product system)

#### **Module III (10 hours)**

Size separation-laboratory and Industrial techniques, classification, dewatering,

#### **Module IV (06 hours)**

Waste disposal, Flow sheet development, environmental issue.

#### **Text Books:**

1. Mineral Processing Technology by B.A. Wills and Tim Napier-Munn

#### **References:**

1. Jain, S.K., Ore Processing, Oxford – IBH Publishing, 1984.
2. Gaudin, A.M., Principles of Mineral Dressing – McGraw Hill Book Company, 1971.
3. Taggart, A.F., Handbook of Mineral Dressing, John Wiley and Sons, New York, 1990.
3. Wills, B.A. Mineral Processing Technology, Pergamon Press, 1985.
5. Vijayendra, H.G., Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd. 1995.

### **MINERAL PROCESSING LAB**

1. Crushing of the ore and finding the R.R. of the Jaws.
2. Determination of R.R. of the ball mill.
3. Determination of critical speed of the ball mill.
4. Determination of grindability index of ball mill
5. Laboratory screen analysis for finding average particle size.(Sieve analysis)
6. Roll crusher
7. Jigging.
8. Electromagnetic separation.

## **GEOLOGY (3-0-2)**

### **Module I**

**(10 hours)**

Mineral resources: Brief idea about mineral resources of India: Geographical Distribution and reserves, Mining methods. Crystal systems- all normal classes. Petrology- Brief description of Igneous, Sedimentary & Metamorphic rocks, Genesis of common rocks and Minerals.

### **Module II**

**(12 hours)**

Crystallography – Axial relationship, symmetry elements and forms present in normal class of cubic, Tetragonal, Hexagonal, Orthorhombic, monoclinic and Triclinic systems. Mineralogy – Classification of minerals, Physical properties of minerals, Chemical physical and optical properties of silicate mineral groups: Olivine, Garnet, pyroxene, Amphibole, Mica, Felspar and Quartz.

### **Module III**

**(08 hours)**

Mineral Chemistry: Geochemical differentiation, geochemical classification of elements, isomorphism polymorphism, geochemical cycle. Mineral Economics: Sampling, assaying, elementary idea on drilling and mining methods.

### **Module IV**

**(6 hours)**

Mineral Deposits: Classification of mineral deposits, Process of formation of mineral deposits- Magmatic concentration, Hydrothermal, Residual and Mechanical concentration, contact metasomatism, Oxidation and supergene sulphide enrichment, sublimation, Evaporation and Metamorphism. Uses Mineralogy, mode of occurrence, genesis and Indian distribution of ore deposits viz., Iron, Manganese, chromium, Aluminium, Copper, Lead and Zinc, Radioactive minerals.

### **Text Books:**

1. Text Book of Geology – P.K.Mukherjee
2. Text Book of Geology- G.B. Mahapatra
3. Parbin Singh. Geology for Engineers, IBH Publications, N. Delhi. 1991.
4. Arthur Holemess, Principles of Physical Geology, Thomas Nelson and Sons, USA, 1964.
5. Ford, W.E. Dana's Textbook of Minerology (4th edition), Wiley Eastern Ltd., N. Delhi, 1989.
6. Winter, J.D. An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, N. Delhi, 2001.
7. Billings, M.P. Structural Geology, Prentice Hall Ino., N. Jersey, USA, 1972.
8. Krishnan M.S. Geology of India and Burma, 3rd Edition, IBH Publishers, N. Delhi, 1984.
9. Engineering Geology by subinoy Gangopadhyay, Oxford University Press

**Reference Books:**

1. Element of Petrology-Tyrell
2. Structural Geology- Marland P. Billings
3. Ruffles Elements of Mineralogy- H.H.Reid
4. Physical Geology – Sainder Singh
5. Blyth F.G.H. and de Freitas M.H. Geology for Engineers, 7th edition, Elsevier Publications, 2006.
6. Bell F.G. Engineering Geology, Elsevier Publications, 2007

**GEOLOGY LAB**

The student will have to go for four weekends for geological tour besides sessional / practical classes in 3<sup>rd</sup> semester.

- 1) Study of Physical properties of minerals.
- 2) Study of important igneous sedimentary and metamorphic rocks.
- 3) Interpretation of folds and faults from maps.

**PARTICULATE TECHNOLOGY (3-0-2)**

**Module I**

**(08 hours)**

Basic definitions, properties of particulates, storage & handling of Fine particulates. Sampling of solids and slurries- principle, methods, sampling theories, sampling for different application, Indian standards.Laboratory & industrial Sampling techniques.

**Module II**

**(10 hours)**

Production of fine particles and their characterization, particle size distribution, shape, surface roughness, porosity; packing in heaps and sediments; particle charge; adsorbed material; interfacial tension; granule strength/attrition/deformation.

**Module III**

**(12 hours)**

Powder Storage - Angle of repose, hopper storage, fines percolation. Mechanical transport – Belt, bucket and screw conveyors; flowability, dynamic weighing, power consumption, selection based on particle size/shape/strength of agglomeration.Convective transport – sedimentation rate, suspension in stirred tanks, rheology of slow-settling slurries.

**Module IV**

**(06 hours)**

Bulk solids packing density and ratio, Bulk solids properties – bulk density, true density, abrasivity, voidage, friability and flowability.Fundamentals of blending – effects of component size, shape, and density on blend time.

**Text Books:**

1. Introduction to Particle Technology by Martin Rhodes
2. J. K. Beddow, Particulate Science and Technology.
3. R. B. Bird, W. E. Stewart, and E. N. Lightfoot Transport phenomena, John Wiley & Sons; Revised 2nd Edition Edition, 2007
4. M. Leva, Fluidization.

**PARTICLE TECHNOLOGY LAB**

Methods of sampling, accuracy and precision of sampling. Determination particle size distribution of powder by Dry sieving, Comparison of wet and dry sieving efficiencies for fine powders, Sieving by alpine air jet sieve sizer, Sub sieve sizing by: Warman cyclosizer, beaker decantation techniques, Andersen Pipette method. Surface area determination. Bulk density, true density and apparent, porosity, variability determination

**ANALYTICAL TECHNOLOGY IN MINERAL ENGINEERING (3-0-0)**

**Module I**

**(06 hours)**

Classification of various minerals such as Sulphides, oxides, Silicates, hydroxides etc by microscopic methods.

**Module II**

**(06 hours)**

Classification of various minerals such as Sulphides, oxides, Silicates, hydroxides etc by spectroscopic methods.

**Module III**

**(12 hours)**

Determination grade of ore such as iron, copper, Zinc, lead, limestone etc by using Volumetric, gravimetric and instrumental methods of analysis.

**Module IV**

**(12 hours)**

Instrumentation methods of analysis, principles of AAS, IR, DTA, TGA etc and their application in mineral processing.

**Text Books:**

1. Essential of polarized light microscopy by John Gustav Delly Scientific Advisor
2. Kauffmann: Characterization of Materials, John Wiley, 2003.
3. D.G.Brandon: Modern Techniques in Metallography, Butterworths, London, 1966.
4. F. Weinberg: Tools and Techniques in Physical Metallurgy, Vols. 1-2, Marcel and Dekkar, 1970.
5. ASM Metal Hand Book, Vol. 10: Materials Characterization, ASM International, 2004.



## **FLUID MECHANICS (3-1-2)**

### **Module I**

**(10 hours)**

Introduction: Scope of fluid mechanics and its development as a science

Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of Meta centric height.

### **Module II**

**(10 hours)**

Fluid kinematics: Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,

Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow network.

### **Module III**

**(12 hours)**

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube.

Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

### **Module IV**

**(08 hours)**

Steady & Unsteady Flows; Overall mass, energy & momentum balance; Navier Stokes equation; Newton's Law, Non-Newtonian Fluids; Laminar flow in falling film, flow through conduits etc; Inviscid fluid flow, Viscous flow, Laminar & Turbulent Boundary Layer Theory, Friction Factor; Flow past immersed objects, packed and fluidized bed.

#### **Text Books:**

1. P. N. Modi and S. M. Seth, Hydraulic and Fluid Mechanics, Standard Book House, New Delhi, 2002.
2. R.K.Bansal, A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications
3. K. C. Patra, Engineering Fluid Mechanics & Hydraulic Machines, Narosa Publishing House, New Delhi, I st edition, 2008.

**Reference Books:**

1. J. F. Douglas, J. M. Gasiorek, J. A. Swaffield, Fluid Mechanics, Pearson Education, Asia, 1st edition, 2002.
2. F. M. White, Fluid Mechanics, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. R. K. Bansal, Fluid Mechanics and Hyd. Machines, Laxmi publisher, New Delhi, 2008.
4. Som & Biswas, Fluid Mechanics and Fluid Machines, Tata McGraw Hill, New Delhi, 2004.
5. Subramanyam, Problems in Fluid Mechanics, Tata McGraw Hill, New Delhi, 2004

**FLUID MECHANICS AND MACHINES LABORATORY**

**A. Flow Measurement**

1. Calibration of Rotometer
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Verification of Bernoulli's Theorem

**B. Losses in Pipes**

6. Determination of friction coefficient in pipes
7. Determination of losses due to bends, fittings and elbows

**C. Pumps**

8. Characteristics of Centrifugal pumps
9. Characteristics of Gear pump
10. Characteristics of Submersible pump
11. Characteristics of Reciprocating pump D. Turbines
12. Characteristics of Pelton wheel turbine
13. Characteristics of Francis turbine E. Determination of Metacentric height
14. Determination of Metacentric height

**ENGINEERING ECONOMICS**

*L/T (Hours per week):2/1, Credit: 3*

**Module I (12 hours)**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### **Module II (12 hours)**

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### **Module III (12 hours)**

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

### **Text Books**

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## **ORGANIZATIONAL BEHAVIOUR**

**Credit- 3      Class Hours - 40**

### **Objectives:**

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

Unit	Contents	Class Hours
01	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.  <b>Perception:</b> Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). <b>Motivation:</b> Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	<b>Foundations of Group Behavior:</b> The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. <b>Managing Teams:</b> Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. <b>Leadership:</b> Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders.	9
04	<b>Organizational Culture :</b> Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	8
05	<b>Organizational Change:</b> Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin’s-Three step model, Seven Stage model of Change & Kotter’s Eight-Step plan for Implementing Change, Leading the Change Process,	7

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

## HONOURS SUBJECT

### **METALLURGY THERMODYNAMICS AND KINETICS (4-0-0)**

#### **Module I**

**(12 Hours)**

Importance of Thermodynamics, definition of thermodynamic terms; concept of states, simple equilibrium. Equation of states, extensive and intensive properties, homogeneous and heterogeneous systems. Phase diagram of a single component system. Internal energy, heat capacity, enthalpy, isothermal, and adiabatic processes.

#### **Module II**

**(10 Hours)**

Second law of thermodynamics, entropy, degree of reversibility and irreversibility, criteria of equilibrium, auxiliary functions, combined statements, Maxwell's relations, transformation formula, Gibbs-Helmoltz equation.

Concept of Third law of thermodynamics, temperature dependence of entropy, statistical interpretation of entropy, Debye and Einstein concept of heat capacity, relation between  $C_p$  and  $C_v$ , consequences of third law.

#### **Module III**

**(08 Hours)**

Fugacity, activity, equilibrium constant, use of S-functions, controlled atmospheres, homogeneous and heterogeneous equilibria.

Ellingham – Richardson diagrams, phase stability diagrams.

Solutions: partial molal quantities, ideal and non-ideal solutions, Henry's law, Gibbs – Duhem equation, regular solution, quasi-chemical approach to solution, statistical treatment. One weight percentage standard state, chemical potential, phase relations and phase rule – its applications.

## **Module IV**

**(10 Hours)**

Free energy – composition diagrams for binary alloy systems, determination of liquidus, solidus and solvus lines. Effect of pressure on phase transformation and phase equilibria.

Thermodynamics of electrochemical cells, solid electrolytes. Thermodynamics of point defects in solids.

Introduction to metallurgical kinetics: heterogeneous reaction kinetics: gas-solid, solid – liquid, liquid – liquid and solid-solid systems. Empirical and semi-empirical kinetics, concept of Johnson – Mehl equation, thermal analysis.

## **References**

1. Introduction to the Thermodynamics of Materials by D.R.Gaskell; Taylor and Francis.
2. Physical Chemistry of Metals by L.S.Darken & R.W. Gurry; McGraw Hill Book Company Inc.
3. Problems in Applied Thermodynamics by C. Bodsworth & A.S. Appleton; Longmans, Green and Co. Ltd.
4. Introduction to Metallurgical Thermodynamics by R.H.Tupkary; tu publishers, Nagpur.
5. Problems in Metallurgical Thermodynamics & Kinetics by G.S. Upadhyay & R.K.Dube; Pergamon Press.
6. Chemical and Metallurgical Thermodynamics – Part I & II by M.L.Kapoor.
7. Kinetics of Metallurgical Reactions by H.S.Ray; Oxford and IBH Publishing Co.
8. Textbook of Materials and Metallurgical Thermodynamics by A. Ghosh; Prentice Hall of India

**MINOR SUBJECT**

**“Will be uploaded soon”**

## MINING ENGINEERING

### **MINE SURVEY - I**

#### **Module-I(10 Hours)**

Linear Measurements and Chain Survey: Uses of various types of chains and tapes. Measurement of correct length of line. Direct and Indirect ranging. Chaining along sloping ground. Obstacles in chaining. Errors and their elimination.

#### **Module-II(10Hours)**

Compass Survey: Uses of prismatic compass, Temporary adjustment, Bearing of a line, Local attractions, Correction of bearing.

Theodolite Survey: Use of theodolite, Temporary adjustment, Measuring horizontal and vertical angles, Theodolite traversing.

#### **Module-III(10Hours)**

Levelling: Use of dumpy level and levelling staff. Temporary and permanent adjustment of dumpy level. Reduction of levels by HI and rise & fall method. Error due to curvature & refraction. Sensitiveness of bubble tube, reciprocal levelling, levelling difficulties and common errors. Automatic and Electronic or Digital levels, Contouring: Contour interval and horizontal equivalent, characteristics of contours, methods of contouring- different and indirect method, contour gradient.

#### **Module-IV(6Hours)**

Modern Surveying Instruments – Electromagnetic Spectrum, Radar, Electronic Distance Measurement, EDM Equipment, Corrections to measurement, Digital Theodolite, Total Stations, Introduction to Remote Sensing and GIS

#### **Text Books**

1. Surveying & Levelling. Vol-I by T.P.Kanethar&S.V.Kulkarni, Pune Vidyarthi Griha Prakashan
2. Surveying and Leveling by R. Subramanian, Oxford University Press
3. Surveying- Vol.I, by B.C. Purmia, Laxmi Publications

#### **Reference Books**

1. Surveying Vol-1 by R Agor, Khanna Publishers
2. Mine Surveying and Levelling S.Ghatak
3. A Textbook of Surveying, C. Venkatramaiah, Universities Press
4. Surveying And Levelling, N.N. Basak, McGraw-Hill Education

### **MINE SURVEY – I LAB**

1. Testing of chain and measurement of correct length of the line.
2. Traversing by Compass
3. Horizontal and vertical angle by theodolite
4. Traversing by theodolite
5. Use of dumpy level and automatic level for fly levelling.
6. Contouring
7. Measurement of distance by Total Station
8. Measurement of horizontal and vertical angle by Total Station

### **FUNDAMENTALS OF GEOLOGY**

#### **Module – I (4 Hours)**

**Science of Geology and Earth Forming processes** – Agents of erosion, transportation, diastrophism, earth quakes, underground water and sea

#### **Module – II (10 Hours)**

**Mineralogy** – Minerals and their properties, Classification of minerals, Common ore forming minerals (Quartz, Feldspar, muscovite, biotite, chlorite, olivine, calcite, dolomite, tourmaline, pyrite, chalcopyrite, galena, sphalerite, hematite, magnetite, pyrolousiteetc).

#### **Module – III (12 Hours)**

**Petrology** – Rocks and their types (igneous, sedimentary and metamorphic), Description of rocks Igneous rocks, magma and lava, extrusive and intrusive forms, textures; Classification and description of some common igneous rocks (Granite, Dolerite, gabbro, Basalt, Rhyolite, Pegmatite); Sedimentary rocks, Sedimentation processes; Classification and description of some common sedimentary rocks (Conglomerate, Sandstone, Shale, Limestone); Metamorphic rocks: Processes of metamorphism, textures and structures of metamorphic rocks; Classification and description of some common metamorphic rocks (Slate, Phyllite, Schist, Gneiss, Quartzite, Marble).

#### **Module – IV (10 Hours)**

**Stratigraphy** – Principles and concept of stratigraphy, Broad stratigraphic divisions, Stratigraphy of India with special reference to economic mineral deposits

**Structural geology** - Attitude of planar and linear structures, Unconformities, folds, faults and joints - their nomenclature, Forms of igneous intrusions - dyke, sill and batholiths, Effects of folds and fractures on strata / orebodies.



**Text Books:**

1. Text Book of Geology by P.K.Mukherjee, World Press
2. Engineering and General Geology by Parvin Singh, S K Kataria & Sons
3. Text Book of Geology by G.B. Mahapatra, CBS

**Reference Books:**

1. Engineering Geology by Subinoy Gangopadhyay, Oxford University Press
2. Principles of Petrology by G W Tyrrel, Aitbs Publishers And Distributors
3. Structural Geology by Marland P. Billings, PHI
4. Elements of Mineralogy- Frank Rutley and H H Read, Nabu Press
5. Physical Geology – Sainder Singh

**FUNDAMENTALS OF GEOLOGY LAB**

1. Study of physical properties of minerals and their identification under microscope of common ore forming minerals (Quartz, Feldspar, muscovite, biotite, chlorite, olivine, calcite, dolomite, tourmaline, pyrite, chalcopyrite, galena, sphalerite, hematite, magnetite, pyrolousite etc).
2. Study of physical properties of rocks in hand specimen and identification under microscope of some common igneous, sedimentary and metamorphic rocks.
3. Identification of folds, faults, joints etc

**MECHANICS OF SOLIDS**

**MODULE-I (12 classes)**

Simple Stress and Strain - Load, Stress, Principle of St. Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite bars in tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Compound Stress and strain- Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders. Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

**MODULE-II (10 classes)**

Shear Force and Bending Moment for Determinate Beams - Types of load and Types of support. Support reactions, Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams for **determinate beams**.

**MODULE-III (10 classes)**

Simple Bending of Beams - Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

Deflection of Beams - Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

**MODULE-IV (8 classes)**

Theory of Columns - Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts - Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

**Text Books**

1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Material by S. S. Ratan, Tata McGraw Hill
4. Strength of Materials by R. Subramaniam, Oxford University Press

**Reference Books**

1. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
3. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India

**MINERAL PROCESSING**

**Objective-** Mining deals with extracting valuable minerals from the earth while mineral processing deals with extracting value from the mined minerals. Attending this course will explore the students with various steps involved in processing of minerals, even some students may find a career in this line also after refinement of their knowledge. With time the mined ore grades are depleting and consequently the importance of the subject is growing to make them saleable to the concerned industries.

**Module-I (6 Hours)**

Definition of minerals and ore, Importance of mineral processing to mining engineers, linkage between mining and mineral processing, economics of mineral processing, grade-recovery curve, numerical problems related to grade-recovery using various efficiency criterion, liberation and degree of liberation.

### **Module-II (8 Hours)**

Rock breakage- fundamentals, principles of comminution, energy calculations, Bond work Index, Crushers, Milling operations, particle size distribution, sieving methods including interpretation of data, screening and various industrial screen types, crusher-screen circuit configurations- open and closed circuits.

### **Module-III(16 Hours)**

Physical separation techniques-hydraulic classifiers (spiral and rake classifiers), hydrocyclones-principles of operation, efficiency evaluation and numerical problems, gravity concentration- principles, various designs like flowing film concentrators, jigging, heavy medium separators, magnetic separators- low intensity and high intensity separators and their applications, electrostatic separators, froth flotation-principles, basic reagents, different machines

### **Module-IV (8 Hours)**

Solid-liquid separation-filtration and sedimentation, waste disposal, flow sheet development for some minerals-iron ore, beach sand, lead-zinc ore and chromite ores, environmental issues.

#### **Text Books:**

1. Mineral Processing Technology by B.A. Wills and Tim Napier-Munn

#### **Reference Books**

1. Jain, S.K., Ore Processing, Oxford – IBH Publishing, 1984.
2. Gaudin, A.M., Principles of Mineral Dressing – McGraw Hill Book Company, 1971.
3. Taggart, A.F., Handbook of Mineral Dressing, John Wiley and Sons, New York, 1990.
3. Wills, B.A. Mineral Processing Technology, Pergamon Press, 1985.
5. Vijayendra, H.G., Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd. 1995.

### **MINERAL PROCESSING LAB**

1. Physical examination and identification of minerals.
2. Crushing of ore/ coal in a jaw crusher and to study the size analysis of the product.
3. To study the jaw crusher and determine the actual capacity and reduction ratio.
4. Verification of Rittinger's Law of crushing in a jaw crusher.
5. Crushing of ore/ coal in a roll crusher and to study the size analysis of the product.
6. Crushing of ore/ coal in a gyratory crusher / pulveriser and to study the size analysis of the product.
7. Crushing of ore/ coal in a cone crusher and to study the size analysis of the product.
8. To study the effect of grinding with grinding time in cylindrical ball mill and rod mill.
9. To separate coal from a mixture of coal and stones or quarts by zigging and determine the weight fractions of the products.

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

10. To separate a mixture of two minerals of different densities by gravity concentration using Wilfley Table and determine the weight and density of each fraction of the products.
11. Beneficiation of ore pulp mix using flotation cell.
12. To separate a mixture of iron and sand using magnetic separator and determine its efficiency.
13. Screening of ore/ coal using vibrating screen and determine its effectiveness

### MINE DEVELOPMENT

#### Module-I (8 Hours)

Introduction- Introduction to mining, types of mines and mining, Access to mineral deposits- selection, location, size, shape and types of entry.

#### Module-II (9 Hours)

Drilling- Methods, types, mechanism and operation, drill bits-types, constructional features and applications, advantages and disadvantages, drilling rigs and jumbos

#### Module-III (11 Hours)

Explosives- Classifications, compositions, chemical reaction, types, properties and tests, detonators, fuses, blasting devices and accessories, handling and storage, transportation

#### Module-IV (12 Hours)

Rock Blasting- Mechanism of blasting, blasting pattern and procedure, opencast and underground, controlled blasting, rock cutting

Shaft sinking- Ordinary and special methods, problems and precautions, shaft support and lining

#### Text Books:

1. Surface Mining by Dr.G.B.Mishra, Geominetech Publication, Bhubaneswar
2. Explosives and Blasting Practices in Mines by S K Das, Lovely Prakashan, Dhanbad
3. Explosives and Blasting Techniques by G K Pradhan, MINTECH Publications, Bhubaneswar
4. Blasting Manual by Sandhu&Pradhan
5. Elements of Mining Technology, Volume –I by D J Deshmukh, Denett& Company

#### Reference Books:

1. SME Hand Book
2. Rock Blasting Effects and Operations by P P Ray, Oxford & IBH
3. Engineering Rock Blasting Operations by S Bhanari, CRC Press

**HONOR SUBJECT**

**ROCK EXCAVATION ENGINEERING**

**Module-I (8 Hours)**

**Introduction:** Scope and importance of rock excavation engineering in mining and construction industries; physico-mechanical and geotechnical properties of rocks vis-à-vis excavation method; selection of excavation method. Rock breaking processes: Primary, Secondary and Tertiary, Energy consumption computations

**Module-II (8 Hours)**

**Drilling:** Advances in drilling equipment, pneumatic versus hydraulic, design and operating parameters of surface and underground drilling; evaluation of drill performance; mechanism of bit wear; bit selection; economics of drilling.

**Module-III (12 Hours)**

**Blasting:** Explosives and their selection criteria for rock excavation; blast design for surface excavations and optimisation; advanced blast initiation systems; blast performance evaluation; cast blasting; techno-economic and safety aspects of surface and underground blasting; advances in blast design for underground excavations; contour blasting; computer aided blast designs. Under water drilling and blasting

**Module-IV (12 Hours)**

**Rock Cutting:** Theories of rock tool interaction for surface excavation machinery-rippers, dozers, scrapers, BWE, continuous surface miners, auger drills; theories of rock tool interaction for underground excavation machinery-ploughs, shearers, roadheaders, continuous miners and tunnel boring machines; selection criteria for cutting tools; advanced rock cutting techniques-high pressure water jet assisted cutting. **Recent Developments** in rock excavation machinery

**Text Books:**

1. Principles of Rock Drilling by K U M Rao and B.Misra, Oxford & IBH
2. Surface and Underground Excavations Methods, Techniques and Equipment by R RTatiya, A ABalkema
3. Rock Blasting and Explosive Engineering by P A Persson et al., CRC Press

**Reference Books:**

1. SME Hand Book
2. Rock Blasting Effects and Operations by P P Ray, Oxford & IBH
3. Engineering Rock Blasting Operations by S Bhanari, CRC Press

## ENGINEERING ECONOMICS

*L/T (Hours per week):2/1, Credit: 3*

### Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

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9. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
10. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
11. R.Paneer Seelvan, " Engineering Economics", PHI
12. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
13. Jhingan,M.L., "Macro Economic Theory"
14. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

**Credit- 3      Class Hours - 40**

**Objectives:**

4. To develop an understanding of the behavior of individuals and groups inside organizations
5. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
6. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
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<b>02</b>	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.  <b>Perception:</b> Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). <b>Motivation:</b> Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	<b>10</b>
<b>03</b>	<b>Foundations of Group Behavior:</b> The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. <b>Managing Teams:</b> Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. <b>Leadership:</b> Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders.	<b>9</b>
<b>04</b>	<b>Organizational Culture :</b> Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	<b>8</b>

- 05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

7

### Reference Books

7. Understanding Organizational Behaviour, Parek, Oxford
8. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
9. Organizational Behaviour, K. Awathappa, HPH.
10. Organizational Behaviour, VSP Rao, Excel
11. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
12. Organizational Behaviour, Hitt, Miller, Colella, Wiley

### MINOR SUBJECT

### MINE DEVELOPMENT

#### Module-I (8 Hours)

Introduction- Introduction to mining, types of mines and mining, Access to mineral deposits- selection, location, size, shape and types of entry.

#### Module-II (9 Hours)

Drilling- Methods, types, mechanism and operation, drill bits-types, constructional features and applications, advantages and disadvantages, drilling rigs and jumbos

#### Module-III (11 Hours)

Explosives- Classifications, compositions, chemical reaction, types, properties and tests, detonators, fuses, blasting devices and accessories, handling and storage, transportation

#### Module-IV (12 Hours)

Rock Blasting- Mechanism of blasting, blasting pattern and procedure, opencast and underground, controlled blasting, rock cutting

Shaft sinking- Ordinary and special methods, problems and precautions, shaft support and lining

#### Text Books:

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2. Explosives and Blasting Practices in Mines by S K Das, Lovely Prakashan, Dhanbad
3. Explosives and Blasting Techniques by G K Pradhan, MINTECH Publications, Bhubaneswar
4. Blasting Manual by Sandhu&Pradhan
5. Elements of Mining Technology, Volume -I by D J Deshmukh, Denett& Company

#### Reference Books:

1. SME Hand Book
2. Rock Blasting Effects and Operations by P P Ray, Oxford & IBH
3. Engineering Rock Blasting Operations by S Bhanari, CRC Press



## PLASTIC ENGINEERING

### **FLUID MECHANICS AND MACHINES**

#### **Module I (12 Lectures)**

Introduction : Scope of fluid mechanics and its development as a science

Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface Tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid static Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Buoyancy and flotation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Fluid kinematics : Introduction, description of fluid flow, classification of fluid flow. Acceleration of

fluid particles, flow rate and continuity equation, differential equation of continuity,

#### **Module II (10 Lectures)**

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation,

Hydraulic Measurements: Water level measurements, velocity measurements, discharge measurements, venturimeter, orifice meter, current meter, pitot tube, orifice, notch and weir.

#### **Module III (14 Lectures)**

Hydraulic turbines and pumps: Impulse and reaction turbines, construction and working principle of tangential, radial and axial type turbines. Power of turbines, efficiency of turbines. Construction and working principles of centrifugal type pumps. Power and efficiency of the pump. Positive displacement pump.

Hydraulic systems: hydraulic accumulator, hydraulic intensifier, hydraulic ram, hydraulic lift, hydraulic crane, hydraulic press, hydraulic torque converter.

#### **Text Books:**

1. Fluid Mechanics and hydraulic machines, Modi & Seth
2. Hydraulics fluid machines and fluid machines by S.Ramamrutham

#### **Reference Books:**

1. Fluid Mechanics by A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics by Fox and McDonald, Willey Publications
3. Fluid Mechanics by Kundu, Elsevier
4. An Introduction to Fluid Dynamics by G.K. Batchelor, Cambridge University Press
5. Engineering Fluid Mechanics by Garde et. al., Scitech
6. Fluid Mechanics by J.F. Douglas, J.M. Gasiorek, J.A. Swaffield and L.B. Jack, Pearson Education.

**FLUID MECHANICS & MACHINES LAB**  
**"Will be uploaded soon"**

TENTATIVE

## MATERIAL SCIENCE

### MODULE – I

1. Classification of Engineering Materials. Engineering properties of materials. Selection of Materials.
2. Electron theory of solids : Free electron theory of metals. Electrical conductivity; Thermal conductivity, Quantum theory of free electrons. Band theory of solids, Conductivity of metals
3. Conductors, Insulators, Semiconductors, Intrinsic and extrinsic semiconductors, Band theory of semi conductors Hall effect.
4. Super Conductors – Zero resistivity, Critical magnetic field and critical current density. Type I and II super conductors. Applications of Superconductors.

### MODULE – II

5. Dielectric Materials : Microscopic Displacement of atoms and molecules in an external dc electric field, Polarization and dielectric constant, Dielectric \_nitially\_lity. Temperature dependence, Dielectric Breakdown. Ferro electric material Piezoelectrics, Pyroelectrics, Dielectric Materials as electrical isulators.
6. Magentic Properties of Materials : Dia, Para and Ferro magenetic materials. Theory of magnetism, Ferro magnetic materials or Ferrites, Comparison of magnetic behaviour and magnetic parameters of Dia, Para and Ferro magnetic materials.
7. Optical Properties of Materials : Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres – Principle, structure, application of optical fibre.

### MODULE – III

8. Plastics – Types : Thermosetting and thermoplastics. Transfer moulding, injection moulding, extension moulding, Blow moulding, Welding of plastics; Rubber types, application.
9. Ceramics : Types, Structure, Mechanical properties, applications
10. .Composite Materials : Agglomerated Materials : Cermets, Reinforced Materials : Reinforced Concrete. Glass fibre reinforced plastics, Carbon fiber reinforced plastics. Whiskers, fiber reinforced plastics, Laminated plastic sheets. Tufnol, Properties of composites. Metal matrix composites, manufacturing procedure for fibre reinforced composites.
11. .Environmental Degradation:Oxidation-Direct atmospheric attack,Aqueous corrosion-Electro chemical attack,Glavanic two –metal corrosion,corrosion by Gaseous reduction, Effect of mechanical stress on corrosion,method of corrosion prevention

### Text book:

1. Vijaya M. S., Rangarajan G, Materials Science, TMH
2. Introduction to Materials science for engineers by James.F.shackelford, Madanapalli.k.Muralidhara ,Pearson(sixth edition)

### Reference Book:

1. Rajendra V., Marikani A., Materials Science, TMH
2. Van Vlack L. H., Elements of Material Science and Engineering, Addison Wesley
3. Raghavan , Material Science
4. Callister W.D., Materials Science and Engineering, John Wiley & Sons.
5. Smith, Materials Science & Engineering.Mc. Graw Hill.
6. Processes and Material of manufacture : Lindberg, PHI.

**MATERIAL SCIENCE LAB**

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TENTATIVE

## **STRENGTH OF MATERIALS**

### **Module I (12 hours)**

Elasticity: Stress and strain, compressive, tensile, shear and bearing stress - Stress - strain diagram, Hooke's law, modulus of elasticity, modulus of rigidity, bulk modulus of rigidity, bulk modulus, Poisson's ratio. Relationship between elastic constraints and temperature stresses, composite bars, dead, live and shock loads. Properties of section, calculation of areas, centroid, neutral axis, moment of inertia, modulus of section, radius of gyration with reference to structural shapes.

### **Module II (12 hours)**

Theory of simple bends - relationship between load shearing force and bending moment. Bending moment and shear force diagram for cantilever, simply supported and overhanging beams - bending stresses. Deflection - deflection of beams in simple cases. Principal stresses and strains. Torsion in solid and hollow shafts - combined bending and torsion.

### **Module III (11 hours)**

Thin and thick cylinders and shells subjected to internal and external pressures. Columns and struts - long and short columns - axial and eccentric loading - effect of end conditions - equivalent length and slenderness ratio - Euler and Rankine formulae.

Total Lectures = 35

### **References Books:**

1. R.S. Khurmi, Applied Mechanics and Strength of Materials S.Chand & Co., (6th ed), New Delhi, 1987.
2. P.N. Singh and I.K. Jha, Elementary Mechanics and Solids, Wiley Eastern, New Delhi.
3. Timoshenko, Strength of Materials
4. Singer, Strength of Materials

## **STRENGTH OF MATERIALS LAB**

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## POLYMER CHEMISTRY

### UNIT I 9

Basic concepts of macromolecules - Monomers- Functionality - Classification and nomenclature of polymers.

Types of polymers - plastics and rubbers - Step growth polymerization - Mechanism - Kinetics - Bi-functionalsystems - Poly functional systems.

### UNIT II 9

Addition polymerization Mechanism and kinetics of free radical- Cationic-Anionic Polymerisation - Initiatorsystems - Chain length and degree of Polymerisation - Control of molecular weight- Chain transfer-Inhibition Coordination polymerisation Mechanism - Kinetics- Ring opening polymerization - Dienepolymerization - Advanced Polymerization Techniques - Atom Transfer Radical Polymerization (ATRP), Group Transfer Polymerization (GTP), Reversible Addition Fragmentation Termination (RAFT).

### UNIT III 9

Copolymerization - Mechanism and Kinetics of free radical - Ionic copolymerization. Types of copolymers-Copolymer composition - Determination of Monomer reactivity ratios. Polymerization techniques - Bulk polymerization - Solution polymerization - Suspension polymerization - Emulsion polymerization - Interfacial condensation.

### UNIT IV 9

Molecular weight - Molecular weight averages- Molecular weight distribution- Unidispersity, polydispersity, degree of polymerization - Molecular weight determination - Basic concepts of end group analysis, colligative properties, osmometry, light scattering, and gel permeation chromatography -Viscosity of polymers solutions, size of the polymer molecules.

### UNIT V 9

Chemical reactions of polymers -Hydrolysis - Acidolysis - Aminolysis-Hydrogenation- Addition and substitution reactions-crosslinking reactions. Polymer degradation- Mechanical degradation-Mechano-chemical degradation-Oxidative degradationHydrolytic degradation- Photodegradation.

### TEXT BOOKS:

1. F.W. Billmeyer, -Textbook of Polymer Science||, Wiley international publishers, 2000
2. George Odian , - Principles of polymerisation||, Seymour Robert
3. V.R. Gowariker, -Polymer Science|| - New Age International (P) Ltd, Publishers

### REFERENCES:

1. JM.G. Cowie, -Polymers: Chemistry and Physics of Modern Materials||, Blackie, and London, 1991.
2. R.J. Young and P.Lovell, -Introduction to Polymers||, 2nd Ed., Chapman & Hall, 1991.
3. Premamoy Ghosh, -Polymer Science and Technology of Plastics and Rubbers||, Tata McGraw- Hill, New Delhi, 1990

## POLYMER CHEMISTRY LAB

### OBJECTIVE:

To train the student to identify plastics and rubbers by different methods

### LIST OF EXPERIMENTS

Identification of polymers by simple methods like density, melting point, burning characteristics, solubility and confirmatory test by chemical analysis.

#### A. PLASTICS

1. Polyethylene
2. Polypropylene
3. Polystyrene
4. Polyvinyl Chloride
5. Polyamide
6. Polyethyleneterephthalate
7. Polybutyleneterephthalate
8. Polycarbonate
9. Polyacetal
10. Polyphenyleneoxide
11. Polyphenylenesulphide
12. PhenolFormaldehyde
13. Ureaformaldehyde
14. Melamineformaldehyde

#### B. IDENTIFICATION OF RUBBERS BY SIMPLE METHODS

1. NaturalRubber (NR)
2. PolybutyleneRubber (BR)
3. StyreneButadieneRubber (SBR)
4. IsopreneRubber (IR)
5. IsobutienIsoprene Rubber (IIR)
6. ChloropreneRubber (CR)
7. Acrylonitrile-ButadieneRubber (NBR)
8. SiliconeRubber

## PHYSICAL CHEMISTRY OF POLYMERS

### UNIT I 9

Potential energy and conformational energy of molecules - Staggered and eclipsed states - conformations and configurations, isomeric states and isomerism in polymers - Tacticity, stereoisomerism, geometric isomerism - Unperturbed and Gaussian chains - Random coils and average end to end distance - Freely jointed and freely rotating chain models - Random flight analysis.

### UNIT II 9

Thermodynamics - First and second law of Thermodynamics, Carnot cycle - Entropy and enthalpy - Energy driven and entropy driven elasticity - Thermoelasticity - Thermodynamic treatment of rubbers - entropic and energetic contributions to the elastic force in rubbers - Stastical mechanical theory.

### UNIT III 9

Amorphous State - Transition temperatures - Glass transition temperature - Free volume, kinetic, and

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thermodynamic views of glass transition - Factors influencing glass transition temperature. Crystalline State - Crystal systems, unit cells, primitive cell, Bravais lattices, polymorphism - Polymer single crystals, lamellae, spherulites, supermolecular structures, fringed micelle model - Degree of crystallinity, factors affecting crystallinity - X-ray diffraction.

### UNIT IV 9

Chain orientation - Concept of chain orientation - orientation in amorphous and crystalline polymers - Uniaxial and biaxial orientation practical significance - Orientation processes - fibre spinning, blown film extrusion, solid state extrusion, profile extrusion - Properties of oriented polymers - Birefringence.

### UNIT V 9

Polymer solutions - Terms and definitions, types of solutions - Hilderbrand approach, Flory Huggins theory - Thermodynamic view of miscibility, upper critical solution temperature (UCST), lower critical solution temperature (LCST) - Concentration regimes in polymer solutions - theta conditions.

#### TEXT BOOKS:

1. S. Glasstone and D. Lewis, Elements of Physical Chemistry, Macmillan India Press, Madras, 1995.
2. Paul C. Painter and Michael M. Coleman, Fundamentals of Polymer Science, Technomic Publishing Co. Inc., Lancaster, USA, 1994.

#### REFERENCE:

1. Ulf W. Gedde, Polymer Physics, Chapman & Hall, 1995.
- 2.

## ENGINEERING ECONOMICS

*Theory L/T (Hours per week):2/1, Credit: 3*

### Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.



### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

#### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

Credit- 3

Class Hours - 40

#### Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude,	10

Barriers to changing attitudes.

**Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

**Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

**Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

**03 Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **9**

**Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

**Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

**04 Organizational Culture :** Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality. **8**

**05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. **7**

Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

**Reference Books**

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

**HONOR SUBJECT**

**"Will be uploaded soon"**

**MINOR SUBJECT**

**"Will be uploaded soon"**

**PRODUCTION ENGINEERING/ MANUFACTURING ENGINEERING**

**MANUFACTURING TECHNOLOGY-I**

*Theory L/T (Hours per week): 3/0, Credit: 3*

**Module-I (10 classes)**

**Manufacturing process:** Definition, Manufacturing process vs. manufacturing system, Classification of manufacturing process, selection of materials and processes.

**Sand Casting :** Pattern – materials, allowances, types, molding types, molding procedure, molding and properties, testing of molding sand, cores, core materials, properties of core making. Melting and founding of cast iron, degasification, design of casting and risering, pouring and feeding of casting, casting defects and inspection.

**Special casting:** Melting of steels and non-ferrous metals and alloys, solidification, shell mould casting, investment casting, Die casting, and centrifugal casting.

**Module-II (10 classes)**

**Fusion welding processes:** Introduction, oxy-fuel gas welding, arc welding processes-I (consumable electrode): principle, equipment, power sources, principle of metal transfer, Electrodes, Submerged arc welding, Gas Metal Arc Welding, arc welding processes-II (non-consumable electrode): Gas Tungsten Arc Welding, Plasma Arc Welding, Defects in welding, Gas and arc cutting.

Brazing, Soldering, Adhesive Bonding, Mechanical fastening and joining plastics

**Module-III ( 08classes)**

**Solid state welding process:** Introduction, Ultrasonic welding, Friction welding, Resistance welding, Explosion welding.

**Other welding processes:** Thermit welding, Electron beam welding, Laser beam welding

**Metallurgy of welding:** Welding design and process selection: Introduction, welded joint, weld quality, weldability, testing of welded joint.

**Module - IV (08 classes)**

Hot and cold working of metals, Classification, Advantages, Limitations and applications of Extrusion, Forging and Rolling , Wire Drawing, Classification, Advantages, Limitations and applications, Sheet Metal Working: Deep drawing process.

**Text Books:**

1. Manufacturing Technology: Foundry, Forming and Welding by P.N. Rao, TMH.
2. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern

## References

1. Principles of manufacturing Materials and processes, by James S. Campbell, TMH.
2. Welding Metallurgy by G.E. Linnert, AWS.
3. Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd.
4. Manufacturing Engineering and Technology, 4<sup>th</sup> Edition- S.Kalpajian and S.R. Scsimid, Pearson Education.
5. Manufacturing Process, J.P.Kaishish, PHI

## **MANUFACTURING TECHNOLOGY-I**

***Practical L/T/P (Hours per week): 2, Credit: 1***

### **Laboratory Experiments (Minimum 8 experiments)**

1. Determination of grain size, clay content, permeability and green compressive strength of Molding sand. (2 to 3 experiments)
2. Practice and preparation of job in Gas welding
3. Practice and preparation of job in Arc welding
4. Practice and preparation of job in TIG/MIG welding ( 2experiments)
5. Practice and preparation of job in sheet metal using processes like forming and deep drawing.
6. Demonstration of different rolling mills
7. Demonstration of Extrusion processes

## **INTRODUCTION TO PHYSICAL METALLURGYAND ENGINEERING MATERIALS**

***Theory L/T (Hours per week): 3/0, Credit: 3***

### **MODULE-I (08 Lectures)**

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

### **MODULE-II (08 Lectures)**

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystalization and grain growth; hot working.

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

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### MODULE-III (10 Lectures)

Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d) Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel.

T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

### MODULE-IV (10 Lectures)

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic:- Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Fibre reinforced plastics, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

#### Text Books:

1. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
2. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.
3. Physical Metallurgy: Principles and Practice by Raghavan, PHI

#### Reference Books

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
2. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
3. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
4. Elements of Materials Science & Engineering by Van Vlack, Pearson
5. Mechanical Metallurgy by Dieter, Tata MacGraw Hill
6. Composite Material science and Engineering by K. K. Chawla, Springer
7. Material Science and Metallurgy, by U. C. Jindal, Pearson

## **APPLIED THERMODYNAMICS**

*Theory L/T (Hours per week): 3/0, Credit: 3*

### **Module-I ( 6Lectures)**

#### **Review of First and Second laws:**

First law analysis of unsteady flow control volumes, Entropy generation ,Entropy balance for closed systems and steady flow systems, Available energy, Quality of energy, Availability for non flow and flow process, Irreversibility, Energy balance, Second law efficiency.

### **Module - II (8 Lectures)**

**Air Standard Cycle & Introduction to I.C. Engine:** Otto, diesel and dual cycles, description and operation of four and two stroke cycle engine, comparison of SI and CI engines, valve timing diagram, power output and efficiency calculation.

**Reciprocating Air Compressors:** Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors

### **Module - III (10 Lectures)**

**Steam And Steam Generator :-** Properties of steam, measurement of dryness fraction, use of steam table. T-S and H-S diagrams for representing thermodynamic processes.Boiler, Classification of boiler, comparison between water tube boiler and fire tube boiler.Boiler mountings and accessories. Description of Cochran & Babcock -Wilcox boiler.

**Steam Nozzles :-** Types of nozzles, isentropic flow through nozzles, effect of friction on nozzle efficiency. Critical pressure ratio and maximum discharge, throat and exit area.

### **Module - IV (12 Lectures)**

**Steam Turbines &Condensers:-** Turbine type and applications. Impulse turbine, pressure and velocity compounding, velocity diagram, work output, losses and efficiency. Impulse reaction turbine, velocity diagram, degree of reaction, work output, losses and efficiency.Jet and surface condensers.Condenser vacuum and vacuum efficiency.

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**Heat Transfer** : Basic modes of heat transfer, one dimensional steady state, conduction through slab, cylinder and sphere ; basic theory of radiant heat transfer, black body & mono chromatic radiation, total emissive power.

**Refrigeration system:** Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), The vapor compression cycle, The vapor absorption cycle.

### Text Books

1. Engineering Thermodynamics by P. K. Nag, Publisher:TMH
2. Engineering Thermodynamics by P. Chattopadhyay, OXFORD
3. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons
4. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI

### Reference

1. Engineering Thermodynamics by M.Achyuthan, PHI
2. Engineering Thermodynamics by Y.V.C. Rao, University Press
3. Thermodynamics and Thermal Engineering by Kothandaraman & Domkundwar, Dhanpat Rai
4. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers
5. Steam Tables in SI Units by Ramalingam, Scitech
6. Steam Tables by C.P.Kothandaraman, New Age International

***Practical (Hours per week): 2, Credit: 1***

### Laboratory Experiments: (Minimum 8 experiments)

1. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
2. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.
3. Study of steam power plant.
4. Study of refrigeration system.
5. Study of gas turbine power plant.
6. Performance analysis of reciprocating air-compressor.
7. Performance analysis of Centrifugal / Axial Flow compressor.
8. Determination of performance characteristics of gear pump.
9. Measurement of steam quality using calorimeter
10. Verification of Joule-Thomson coefficient.



## THEORY OF MACHINE

*Theory L/T (Hours per week): 3/0, Credit: 3*

### **Module-I(10 classes)**

Mechanism: Basic Kinematic concepts and definitions, mechanism, link, kinematic pair, classification of kinematic pairs, degree of freedom, kinematic chain, binary ternary and quaternary joints and links, degrees of freedom for plane mechanism, grubler's equation, inversion of mechanism, four bar chains and their inversions, single slider crank chain, double slider crank chain and their inversion.

### **Module-II(10 classes)**

Friction of a screw and nut, square threaded crew, V-threaded screw, pivot and collar, friction circle, friction axis, friction clutches, transmission of power by single plate, multiplate and cone clutches.

Gear trains: simple train, compound train, reverted train, epicyclic train and their application.

### **Module-III(08 classes)**

Toothed gears: Theory of shape and action of tooth properties methods of generation of standard Tooth profiles, Standard proportions, Interference and Under-cutting, methods of Eliminating Interference, Minimum numbers of teeth to avoid interference.

### **Module-IV(08 classes)**

Governors: Centrifugal Governors-watt and Porter Governors, Spring loaded Governor-Hartnell Governor ,sensitiveness, stability, Isochronisms ,Hunting, Governor effort and power, curves of controlling force.

### **Text Book(S):**

1. Theory of machines – S.S Ratan, Tata McGraw Hill.
2. A Textbook of theory of machines (in S.I units) – R.K.Bansal, Laxmi Publication.

### **Reference(S):**

1. Mechanism and machine Theory- Rao and Dukkipati, Wiley Eastern Ltd.
2. Theory of Machines –Thomas Beven.

*Practical (Hours per week): 2, Credit: 1*

### **Laboratory Experiments: (Minimum 8 experiments)**

1. Determination of gyroscopic couple.
2. Performance characteristics of spring loaded governor.
3. Determination of critical speed of rotating shaft.
4. Experiment on static and dynamic balancing apparatus. (2 experiments)

5. Determination of natural frequency under damped and un-damped vibration.(2 experiments)
6. Study of interference and undercutting for gear.
7. Radius of gyration of compound pendulum
8. Radius of gyration of connecting rod Experiment on Screw Jack
9. Experiment on Journal Bearing Apparatus
10. Experiment on Epicyclic Gear Train
11. Experiments on Simple/Compound/Reverted Gear trains
12. Experiment on Dynamometer

## **STRENGTH OF MATERIAL**

*Theory L/T (Hours per week): 3/1, Credit: 3*

### **Module-I(10 classes)**

Analysis of axially loaded members: Composite bars in tension and compression-temperature stresses in composite rods-statically indeterminate problem. 2D Stress system, Principal Planes, Principal stress, Mohr's stress circle, Members in biaxial state of stress: Stresses in thin cylinders, thin spherical shells under internal pressure-wire winding of thin cylinders. Strain & deformation: Two dimensional state of strain, Principal Strains, Calculation of principal stresses from principal strains, Strain measurement.

### **Module-II(10 classes)**

Shear force and bending moment diagrams for simple beams: Support reactions for statically determinate beams, relationship between bending moment and shear force, shear force and bending moment diagrams.  
Simple bending of beams: Theory of simple bending of initially straight beams, distribution of normal and shear stress, composite beams.

### **Module-III(12 classes)**

Torsion in solid and hollow circular shafts, Twisting moment, strength of solid and hollow circular shafts, Strength of shafts in combined bending and twisting, Close-coiled helical springs.  
Deflection of Beams: Slope and deflection of beams by integration method and area-moment method.

### **Module-IV(10 classes)**

Buckling of columns: Euler's theory for initially straight columns with various end conditions.  
Theories of failure: maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, Maximum strain energy theory and maximum distortion energy theory.

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### **Text book(s):**

1. Strength of Materials- G.H.Ryder, Macmillan India.
2. Mechanics of Materials- J.M.Gere and S.Timoshenko.
3. Strength of Materials by R.Subramaniam, Oxford University Press

### **Reference(s):**

1. Mechanics of Materials-I- E.J. Hern; Paragaman.
2. Introduction to Mechanics of Solids- Crandell, Dahl and Lardner, McGraw Hill.
3. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
4. Mechanics of Materials by R.C.Hibbeler, Pearson Education

***Practical (Hours per week): 2, Credit: 1***

### **Laboratory Experiments (Minimum 8 experiments)**

1. Determination of tensile strength of materials by Universal Testing Machine
2. Determination of compressive strength of materials by Universal Testing Machine
3. Determination of bending strength of materials by Universal Testing Machine
4. Double shear test in Universal Testing Machine
5. Determination of Impact strength of material (Charpy and Izod)
6. Determination of Hardness strength of materials (Brinell, Rockwell and Vickers)
7. Determination of Rigidity modulus of material
8. Determination of Fatigue strength of material
9. Estimation of Spring Constant under Tension and Compression.
10. Load measurement using Load indicator, Load Cells.
11. Strain measurement using Strain Gauge.
12. Stress measurement using strain rosette.

## **ENGINEERING ECONOMICS**

***L/T (Hours per week):2/1, Credit: 3***

### **Module I (12 hours)**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### **Module II (12 hours)**

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### **Module III (12 hours)**

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

### **Text Books**

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunakaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## **ORGANIZATIONAL BEHAVIOUR**

**Credit- 3      Class Hours - 40**

### **Objectives:**

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

Unit	Contents	Class Hours
01	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.  <b>Perception:</b> Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). <b>Motivation:</b> Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	<b>Foundations of Group Behavior:</b> The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. <b>Managing Teams:</b> Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. <b>Leadership:</b> Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders.	9
04	<b>Organizational Culture :</b> Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	8
05	<b>Organizational Change:</b> Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin’s-Three step model, Seven Stage model of Change & Kotter’s Eight-Step plan for Implementing Change, Leading the Change Process,	7

Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

## HONOURS ELECTIVE

### COMPOSITE MATERIALS

*Theory L/T (Hours per week): 4/0, Credit: 4*

#### Module - I (10 hours)

Introduction and characteristics of composite materials, mechanical behaviour of composites, constituents, Reinforcements, Matrices, Fillers, Additives, Applications and advantages of composites.

Classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

#### Module - II (12 hours)

Characteristics of Polymer matrix composites – Characteristics of resins, Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

Characteristics of Metal Matrix Composites, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

#### Module - III (10 hours)

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

**Module - IV(10 hours)**

**Advances in composites:**

Carbon / carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique.Composites for aerospace applications.

**Text Book**

1. Chawla K.K., Composite materials, Springer – Verlag, 1987
2. Mathews F.L. and Rawlings R.D., Composite materials: Engineering and Science, Chapman and Hall, London, England, 1st edition, 1994.
3. Mechanics of Composite Materials, R.M. Jones, Mc. Graw Hill Book Co.

**Reference Book :**

1. Fibre - Reinforced composites :- Materials, manufacturing and Design by P.K. Mallick, CRC Press.
2. Composite materials, Broutman & Crock,
4. Principles of Composite Material Mechanics, R.F.Gibson, CRC Press

**(or) HONOR ELECTIVE**

**SURFACE ENGINEERING PRINCIPLE AND PRACTICE**

*Theory L/T (Hours per week): 4/0, Credit: 4*

**Module-I (10 classes)**

Mechanisms of Wear and Metal Cleaning: Basic Mechanisms of wear-abrasive, adhesive wear, contact fatigue, Fretting corrosion, Testing of wear resistance, practical diagnosis of wear, general cleaning process for ferrous and non ferrous metals and alloys selection of cleaning processes, alkaline cleaning, emulsion cleaning, ultrasonic cleaning, pickling salt bath descaling, abrasive bath cleaning, polishing and buffing shot peening.

**Module-II(10 classes)**

Thermal Spraying Processes and Electrodeposited Coatings: Thermal spraying materials, characteristics of thermal spray processes, Design for thermally sprayed coatings coating production, spray fused coatings, Principles of electroplating, Technology and control-electroplating systems, Properties and applications of electrodeposits, Non aqueous and electroless deposition, plasma coating.

**Module-III (12 classes)**

Hot Dip Coating and Diffusion Coating: Principles, Surface preparation, Batchcoating and continuous coating process, Coating properties and application, Principles of cementation, Cladding-vacuum deposition, Sprayed metal coating, Structure of diffusion coatings, Chemical vapour deposition (CVD), Physical vapour deposition (PVD).

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

Non-Metallic Coating Oxide and Conversion Coatings: Plating coating, lacquers, rubbers and elastomers, vitreous enamels, anodizing Chromating, application to aluminium, magnesium, tin, zinc, cadmium copper and silver, phosphating primers.

### **Module-IV (10 classes)**

Quality Assurance, Testing and Selection of Coatings: The quality plan, design, testing and inspection, thickness and porosity measurement, selection of coatings, industrial applications of engineering coatings.

#### **Text book(s):**

1. Electroplating and other Surface Treatments; C.D.VARGHESE; TMH, 1993.
2. Engineering Coatings-design and application- S. Grainger, Jaico Publishing House.

#### **Reference(s):**

1. Electroplating Handbooks- N.V.Parathasarathy, Prentice Hall.
2. Advances in surface treatment- Niku-Lavi, Pergamon.
3. Metal Pretreatment; N.D.BANIK; TMH, 1992
4. Principles of Metals surface treatment and protection- D. R. Gabe, Pergamon.

## **MINOR SPECIALIZATION**

### **MANUFACTURING PROCESS**

*Theory L/T (Hours per week): 4/0, Credit: 4*

#### **Module-I (10 classes)**

**Manufacturing Processes:** Introduction to manufacturing processes, Classification and Selection of Manufacturing Processes.

#### **Metal Casting Processes:**

Patterns, Types of patterns, allowances and material used, moulding materials, Metal casting: Types of casting processes, advantages, disadvantages and applications of casting processes; Green sand moulding and permanent moulding, casting defects.

#### **MODULE 2 (12 classes)**

**Metal Joining Processes:** Principle of welding, Classification of welding. Capabilities and applications; Gas welding and gas cutting, Arc welding, Power sources and consumables, Resistance welding: Spot, Projection and seam welding process, Defects in welding, Introduction to Soldering and Brazing.

**Metal Shaping and Forming:** Hot and cold working of metals, Classification, Advantages, Limitations and applications of Extrusion, Forging and Rolling, Wire Drawing, Classification, Advantages, Limitations and applications, Sheet Metal Working: Deep drawing process.



**MODULE 3 (10 classes)**

**Metal Cutting Principles:** Machine tools classification, working and auxiliary motions in machine tools, Primary cutting motions in machines tools, Cutting tool geometry and tool signature, cutting forces and power requirement in machining

**MODULE 4 (10 classes)**

Advanced Manufacturing Processes

Introduction, equipment, process variables , advantages, disadvantages and applications of Abrasive Jet Machining, Ultrasonic Machining, Chemical Machining Electrochemical Machining, Laser Beam Machining

**Text book(s):**

1. Manufacturing Technology (Foundation Forming & Welding)- P.N. Rao, Tata McGraw Hill.
2. Manufacturing Science, Ghosh and Mallik, East West Press.
3. Principles of manufacturing materials and processes- J.S.Campbell, Tata McGraw Hill.

**Reference(s):**

1. Manufacturing Engineering and Technology, 4th Edition- S.Kalpakjian and S.R. Scsimid,Pearson Education.
2. Robotics Technology and Flexible Automation- S.R.Deb, TMH.
3. Principle of Metal Casting- Heine, Loper and Rosenthal, Tata McGraw Hill.

## TEXTILE ENGINEERING

### **PCTX FIBRE SCIENCE & TECHNOLOGY-I (3-0)**

#### **Module-I ( 12 Hours)**

Introduction of fibres. Introduction of polymers. Requirements and essential properties of fiber forming polymers. Essential and desirable properties of textile fibers. Classification of textile fibers.

#### **Natural fibres :**

**Cotton :** Chemical composition; Grading of cotton - Different Varieties including organic as well as Bt cotton. Distinctive properties and end uses

**Flax:** Extraction process; Chemical composition; Distinctive properties and end uses

**Jute:** Varieties, Extraction process, Chemical composition ; Distinctive properties and end uses

**Wool :** Varieties and grading of wool fibres, Chemical composition; Wool scouring. Distinctive properties and end uses

**Silk :** Varieties of natural silk, Rearing of silk worm, cocooning, silk reeling, throwing and; Chemical composition; Distinctive properties and end uses.

#### **Module-II ( 16 Hours)**

**Man-made fibres :** Classification of man-made fibres, Basic production systems of the man-made fibre - Melt spinning, solution dry spinning and solution wet spinning - basic principles, brief idea about spinning head, spinneret, quench chamber, & coagulation bath, spin finish application.

a) Brief outline of manufacturing process of regenerated fibers viz. viscose rayon and diverse form of viscose, acetate -rayon, cupra-ammonium rayon. Distinctive properties and end uses

b) Raw material, technology of polymerization and brief outline of manufacturing process and parameters for polyester, nylon 6, nylon 66 and polypropylene. Distinctive properties and end uses of those fibres

c) Raw materials, technology of polymerization and brief outline of manufacturing process and parameters for acrylic fibre by dry spinning. Wet spinning of acrylic. Different solvents and parameters of regeneration bath for wet spinning of acrylic. Distinctive properties and end uses

#### **Module III ( 08 Hours)**

**Drawing and heat setting of fibres:** Object of drawing. Concept of neck drawing.

Effect of

drawing conditions on the structure and properties of fiber. Object of heat setting. Effect of

heat setting parameters on the structure and properties of fiber.

**Identification of different fibres:** Identification of fibres by feel, microscopic view, burning behavior and solubility test. Effect of alkalis ,acids, oxidizing & reducing agent and water on natural and ma-made fibres.

**Books Recommended:**

1. Cook Gordon J, "Hand Book of textile fibre", Vol. I and II, Woodhead Fibre Science Series, UK, 1984.
2. "Hand Book of Fibre Chemistry", Ed. M Lewin and E M Pearce, Mercel Dekker Inc.,1998.
3. Shenai V A, " Textile Fibre ", Sevak Publications, Mumbai,
4. W.E. Morton & J.W.S. Hearle, Physical properties of textile fibres, Textile Institute, U.K.
5. Progress in textiles: Science and technology Vol.-2 By Dr. V.K. Kothari, I.I.T. Delhi.
6. Gowariker V R, Viswanathan N V and Sridhar J, "Polymer Science", New Age International Ltd., New Delhi, 1996.
7. Fibre Science and Technology- S P Mishra
8. R.W. Moncrieff - Manmade Fibres
9. Vaidya A A, "Production of Synthetic Fibres", 1st Ed., Prentice Hall of India, New Delhi, 1988.
10. H.F. Mark, S.M. Atlas and E. Cernia," Man-made Fibres Science and Technology, Vol. 1,2,3,"
11. "Manufactured Fibre Technology", 1st Ed. V B Gupta and V K Kothari, 1st Ed., Chapman and Hall, London, 1997.
12. Textbook of Polymer Science by F.W. Billmeyer.

**PCTX Fibre Science & Technology-I Lab. (0-0-2)**

At least 10 experiments are to be performed by each student

Physical and Chemical identification of following Textile fibre(s)

1. Identification of cotton
2. Identification of wool
3. Identification of silk
4. Identification of Bast fibres
5. Identification of polyester
6. Identification of nylon
7. Identification of Acrylic
8. Identification of Polypropylene
9. Identification of fibres and their ratio in blended textile
10. Analysis of P/C blended fabric
11. Analysis of P/V blended fabric
12. Analysis of P/W blended fabric
13. Study of effects of acids, alkalies and oxidising agents on natural and synthetic fibres.

PCTX      **YARN MANUFACTURE – I ( 3-0 )**

**Module – I ( 10 Hours )**

**Introduction:** Definition and classification of yarn, System of expressing yarn linear density. Principle of Yarn formation process from staple fibres - short staple and long staple - opening and cleaning, individualization, drafting, drawing, twisting. Process flow chart of short staple spinning system.

**Ginning :** Objective of ginning, study of ginning machineries, Pre and post ginning, baling of Fibers. Effect of ginning performance on yarn quality.

**Mixing & Blending :**

Objective , different types of mixing & blending, difference between mixing & blending, Principles underlying for the selection of cotton and other fibres for mixing/ blending. Objective of tinting, use of anti-static agents, Different methods of mixing/blending and their advantages and disadvantages Problems in blending of man-made fibre with cotton

**Module – II ( 12 Hours)**

**Blow Room:** Objective, Principles of opening and cleaning - factors influencing opening and cleaning - Degree of opening and clearing. Study of various openers and cleaners used in a modern Blow room line – their construction and principle of operation- position etc. Study of components such as feed apparatus- type of feeding- loose feeding, feeding with clamping rollers , feeding with a roller and pedal levers. Grid bars and their setting. Different type of mixer/blender used in modern blow-room line - their construction and operations. Study of lap forming mechanism, calendar roller pressure, length measuring device, lap defects and its remedies. Chute/flock feed systems to card and their comparison. Idea of accessories and associated equipment (dust removing and disposing devices; material transport devices, material flow control devices, metal extractors, fire eliminator. Brief outline of setting the blow room line for processing different varieties of cotton mixing and man-made fibers

Nature of waste extracted in various openers and beaters, lint-trash ratio, nep generation, fibre breakage and their control. Calculations pertaining to production of blow room and cleaning efficiency, performance assessment of blow room line. Maintenance practices in Blow-room.

**Module – III ( 14 Hours)**

**Carding:** Objectives, principles of roller and clearer card, revolving flat card, detail study of revolving flat card and its components – Constructional features and working details of liker- in, cylinder, doffer and flats of a modern card. Theory of carding and stripping action. Transfer of fibres. Web stripping and coiler system. Card clothing - Selection of card clothing for cotton & synthetics blends- stripping and grinding. Gauging and setting at different zone in a card. Salient features of High production card-. Mechanism of neps and hook formation and their effect on yarn quality- their assessment and control, .Card wastes and their control. Carding defects- their causes and remedies. Calculations pertaining to draft and production. Maintenance practices in carding .Auto leveller in card. Latest developments.

**Drawing:** Objectives, principles of drawing and doubling. Detailed study of draw frame machine. Top and bottom rollers, top roller cots, roller weighting, drafting wave, roller slip and roller eccentricity. Various drafting system in modern drawframe, autoleveller in drawframe, Performance assessment and calculation pertaining to draw frame machine. modern developments in Draw frame, Process parameters and production calculation.

**Books Recommended :**

1. Klein W., "The Technology of Short-staple Spinning ", The Textile Institute, Manchester,
2. Klein W., "A Practical Guide to Opening and Carding ", The Textile Institute, Manchester, 1999
3. Klein W., "A Practical Guide to Combing, Drawing and Roving Frame ", The Textile Institute, Manchester, 1999
4. Oxtoby E –Spun Yarn Technology|| butter worth's, London, New Edition 2002
5. Chattopadhyay R., Technology of Carding, NCUTE, IIT Delhi, 2003.
6. Chattopadhyay R. (Ed), Advances in Technology of Yarn Production, NCUTE, IIT Delhi, 2002 .
7. Salhotra K. R. &Chattopadhyay R., Book of papers on –Blowroom and Carding,IIT Delhi 1998.
8. Duraiswamy I, Chellamani P &Pavendhan A., –Cotton Ginning|| Textile Progress, The Textile Institute, Manchester, U.K., 1993.
9. Lord P.R., "Yarn Production: Science, Technology and Economics ", The Textile Institute, Manchester, 1999
10. Khare A R, "Elements of Blowroom, Carding and Drawframe", Sai book Centre, Mumbai,
11. Foster G A K, "Manual of Cotton Spinning", Vol. I –IV, The Textile Institute, Manchester, 1958.

**PCTX      YARN MANUFACTURE – I LABORATORY (0-0-2)**

At least 10 experiments are to be performed by each student

1. To determine trash content% and analysis of waste by using trash analyser
2. To study and sketch general outline of opener, cleaner and mixer/blender employed in Blow-Room line.
3. To study the feed regulating mechanism in Blow-Room line.
4. To determine the cleaning efficiency of a Blow-room line
5. To study and sketch the working mechanism of various operations of a card with respect to flow of material
6. To study different settings of the card
7. To study the gearing plan and calculate draft constant, draft and production constant of a Card.
8. To study the wire points used in different zone of a card.
9. To process fibres in card and produce sliver and find out sliver hank.

10. To study and sketch the working mechanism of draw frame with respect to flow of Material.
11. To study and sketch the working mechanism of drafting zone of draw frame.
12. To study the roller setting of draw frame drafting system
13. To Calculate draft constant and requirement of draft change pinion to achieve required draft in a Drawframe to produce a sliver of desired hank.
14. To process card slivers and produce sliver in Draw frame and find out sliver hank.

## **PCTX FABRIC MANUFACTURE - I ( 3-0 )**

### **Module-I (10 Hrs)**

**Winding Process** – Objectives, types of packages, types of winding machines - precision winding and drum winding, driving the package e.g., constant surface speed, constant angular speed, varying angular speed, uniform build of yarn package. Study of working principles of warp winding machines- mechanism of yarn traversing, Machine traverse ratio, angle of wind, packages density. Mechanical and electronic type yarn clearer. Yarn tensioners: Additive, multiplicative, combined and compensating type. Patterning: Reasons and remedies. Yarn fault classifying systems. Basic features of auto winders like Autoconer, Barbar colmman, Murata etc. Latest developments. Types and working principles of pirn winding machines. Pirn types and dimensions. Pirn bunching. Pirn winding defects causes and remedies. Production calculations of cone and pirn winders.

### **Module II ( 16 Hrs)**

**Warping Process:** Objectives of warping, material flow in beam warping and creels used in warping machines; sectional warping machines. Package faults, Latest developments in warping. Performance assessment and calculations pertaining to beam and sectional warping machine.

**Sizing Process :** Objectives of sizing; sizing materials and recipe used for different types of fibers; size preparation equipment; sizing machines; Size add on %; Factors affecting size add on; Sizing defects and production calculations; Concept of single end sizing, combined dyeing and sizing. Control concepts in modern sizing machine.

### **Module III (10 Hrs)**

**Drawing-in operations :**Need for drawing-in operation, manual and automatic drawing-in. Selection and care of reeds, healds and drop pins, control of cross ends and extra ends and calculations.

**Weaving Mechanism :**Concept of woven fabric formation. - Overall concept about looms- Classification of looms; constructional features and mechanism of conventional power loom; Introduction to plain and twill weave.

**Books Recommended:**

1. 'Winding', BTRA Monograph Series, Bombay Textile Research Association, Bombay, 1981.
2. 'Warping and Sizing', BTRA Monograph Series, Bombay Textile Research Association, Bombay, 1981.
3. Talukdar M K, Sriramulu P K and Ajgaokar D B, "Weaving – Machine, Mechanism and Management", Mahajan Publisher Private Ltd., Ahmedabad, India, 1998.
4. Booth J E, "Textile Mathematics", Vol.II & III, Textile Institute, Manchester, 1977.
5. Goswami B C, Anandjiwala R D and Hall D M, "Textile Sizing", Marcel Dekker,
6. Ajgaonkar D.B, Talukdar M.K. Wadekar "Sizing: Materials, Methods, Machines" Yarn Winding NCUTE Publication
7. Textile Mathematics Vol. II & III JE Booth
8. Sengupta R "Yarn Preparation", Vol. I & II, Popular Prakasam, Bombay, 1970.
9. Lord P.R. and Mohammed M.H., Weaving – Conversion of Yarn to Fabric, Merrow Publication, 2001.
- 10.

**PCTX FABRIC MANUFACTURE – I LABORATORY(0-0-2 )**

At least 10 experiments are to be performed by each student

1. To study of the passage of yarn through various organs in different winding machines.
2. Study of motion transmission system in winding machine.
3. To study of the effect of slub catcher, yarn tensioner and yarn guide on package formation in winding machine.
4. To study of the mechanical warp stop motion and ribbon breaking mechanism in winding.
5. To study of mechanism of a pirn-winding machine and Calculation of winding speed of Pirn winding machine.
6. To study of passage of yarn through a beam warping m/c and function of its different parts.
7. To study of passage of yarn through a sectional warping m/c and function of its different parts.
8. To study of path of warp sheet in a multi cylinder-sizing machine and the features of its various parts/mechanism(Mill based experiment).
9. To study construction details and passage of materials in single end sizing machine.
10. To prepare a sizing paste and apply on the given sort of yarn samples in a single end sizing machine and also size add on %.
11. To select the proper reed and heald for a weaver's beam and practice proper drawing-in of warp keeping in mind fabric construction.
12. To study the construction details and mechanism of conventional shuttle loom.

**PCTX TEXTILE CHEMICAL PROCESSING –I (3-0 )**

**Module-I (10 Hours)**

**Dry preparatory process:** Mending, Stamping, Shearing and cropping. Singeing-objectives, Different methods of singeing (Plate, Roller and Gas Singeing), drawbacks and advantages.

**Desizing:** Objectives, classification and mechanism of removal of starch in various methods. Efficiency of desizing, Desizing of Synthetics.

**Scouring:** Objectives, mechanism of removal of impurities, recipe and controlling parameters

involved. Scouring of coloured textiles. Scouring of natural, manmade and blended textiles. Evaluation of scouring efficiency.

**Module-II (10 Hours)**

**Bleaching:** Objectives of bleaching, hypochlorite, peroxide and chlorite bleaching. Field of application - Bleaching of cotton, silk, wool, and man-made blended textiles by suitable bleaching agents. Controlling parameters and mechanism. Principles and application of optical brightening and blueing agents.

**Mercerization:** Objectives, Process parameters and operation, mechanism related to various physical and chemical changes in cotton during mercerization. Causticization, Barium activity number - its determination and interpretation. Brief idea of hot and cold ammonia mercerization.

**Module-III (16 Hours)**

**Concept of colour:** Visible spectrum, wavelength and blindness of colour. Metamerism. Primary and secondary colour, shade, tint, Hue, chroma, color wheel

**Theory of dyeing:** Classification of Dyes, Dye-fibre interaction,

**Dyeing of textiles Cellulosic and Protein fibres :** Application of Direct, Reactive, Vat, Sulphur, Azoic dyes on cellulose fibres. Application of Acid, Basic and Reactive dyes on wool and silk. Eco friendly chemicals and banned dyes. Continuous dyeing Range (CDR)

**Books Recommended:**

1. A K Roy Choudhary, –Textile Preparation & Dyeing||, Science Publishers, USA, 2006.
2. Broadbent D.A., –Basic Principles of Colouration||, Society of Dyers & Colourists, 2001.
3. Karmakar S.R., –Chemical Technology in the pretreatment processing of textiles||, Textile Science & Technology, Elsevier Publication, 1999.
4. Shore J, –Cellulosics dyeing||, Society of Dyers & Colourists, Bradford, UK, 1995.
5. Mittal R M and Trivedi S S, –Chemical Processing of polyester / cellulosic Blends||,
6. Trotman, E.R., –Dyeing and Chemical Technology of Textile Fibres||, Charles Griffin and Co. Ltd., London. 1991.
7. Shenai, V.A. –Technology of Bleaching and Mercerizing - Vol. III||, Sevak Publications Chennai, 1991.
8. Bhagwat R.S –Handbook of Textile Processing||, Colour Publication, Mumbai, 1999.
9. Shenai, V.A., –Principle and Practice of Dyeing||, Sevak Publisher, Bombay, 1991.
10. T.L.Vigo, –Textile Processing and Properties||, Elsevier, New York, 1994.



## **PCTX TEXTILE CHEMICAL PROCESSING –I LABORATORY (0-0-2)**

At least 10 experiments are to be performed by each student

1. Desizing of grey cotton yarn/fabric using chemicals/enzyme and determine the desizing efficiency.
2. Scouring of desized cotton yarn/fabric and determine the scouring loss%, drop absorbency and degree of impurities.
3. Scouring of P/C blended fabrics.
4. Bleaching of scoured cotton yarn/fabric with hypochlorite agent and measurement of the whiteness index, and change in mechanical properties
5. Bleaching of cotton fabric with hydrogen peroxide agent and measurement of the whiteness index, and change in mechanical properties.
6. Cold and Hot mercerization of cotton yarn and measurement of the BAN, and change in mechanical properties
7. Scouring and Bleaching of Wool.
8. Degumming of Silk
9. Dyeing of cotton yarn/fabric using direct dyes and studying the influence of Temperature, Time and Electrolyte on dye adsorption and fastness properties.
10. Dyeing of cotton yarn/fabric using vat dyes and assessment of fastness properties of dyed material.
11. Dyeing of cotton yarn/fabric using hot and cold brand reactive dyes and assessment of dye exhaustion % on dye bath and fastness properties.
12. Dyeing of cotton yarn/fabric using azoic dyes and assessment of fastness properties of dyed material.
13. Dyeing of cotton yarn/fabric using sulphur dyes and assessment of fastness properties of dyed material.
14. Dyeing of Wool fibres with Acid and metal complex dyes and assessment of fastness properties of dyed material.
15. Dyeing of Silk yarn / fabric with Acid dyes and direct dyes and assessment of fastness properties of dyed material.

## **PCTX APPLICATION OF STATISTICS FOR TEXTILE MANUFACTURING (3-1-0)**

### **Module-I (12 Hours)**

**Introduction:** Importance of utility of statistical method for quality control in textile manufacturing industry. Applications of statistical measure - Measures of central tendency: Mean Median and Mode – Measures of variation: Range, Mean deviation, standard deviation and coefficient of variation. Population and sample, techniques of sampling, simple random sample, analysis of sample data, representation of sample data, practical examples.

**Statistical Description of Quality: Random Variable, Continuous Random Variable- Normal Distribution, Discrete Random Variable- Binomial Distribution and poisson's distribution.** normal approximation to binomial and poisson,, tables of normal distribution.

### Module-II (12 Hours)

**Testing of Hypothesis and significance level** : Definition of population and sample, sampling distribution of mean and variance. - Estimation of parameters – confidence limit - Errors and choice of sample size Statistical hypothesis Testing of hypothesis for large samples (single mean, difference of means, single proportion, difference of proportions) – Small samples tests based on t and F distributions (single mean, difference of means, paired t- test and variance ratio test) –  $\chi^2$  (Chi-square) test for independence of attributes and goodness of fit.

**Regression:** Introduction. Method of least squares – linear regression equation – correlation coefficient - rank correlation. Regression through origin – multiple regression.

### Module-III (16 Hours)

**Statistical Quality Control:** Concept of process control - General principle of control charts – action and warning limit-Control charts for variables –  $\bar{X}$ , R – charts – Control charts for attributes – p, np, c – charts – Tolerance limits . Pareto charts, Process capability analysis ( $C_p$  and  $C_{pk}$ ), concept of six sigma process control

**Acceptance Sampling:** Basic idea about acceptance sampling, OC curve, producer's risk and customer's risk.

**Design and Analysis of Experiment:** One way and Two way classifications. Design of experiment-Completely randomized design – Randomized block design, Latin square design - factorial design.

#### Books Recommended :

1. Leaf G A V, "Practical Statistics for the Textile Industry", Part-I and II, The Textile Institute, U.K (1984).
2. Montgomery D C, "Introduction to Statistical Quality Control", Fourth Ed., John Wiley and Sons (Asia) Pte. Ltd., Singapore (2004).
3. Mehta P V, "Quality Management: An Overview", in 'Testing and Quality Management', Vol. 1, Ed. V K Kothari, IAFL Publication, New Delhi (1999).
4. Bhattacharya G.K. and Johnson R.A.: Statistical Concepts and Methods, John Wiley, New Delhi, 2002
5. Meloun M and Militky J, "Statistical data analysis: A practical guide", Woodhead Publishing Ltd. UK, 2011.
6. Hayavadana J, "Statistics for textile and apparel management", Woodhead Publishing Ltd., UK, 2012.

## ENGINEERING ECONOMICS

*L/T (Hours per week):2/1, Credit: 3*

### Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunakaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

**Credit- 3      Class Hours - 40**

**Objectives:**

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
<b>01</b>	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	<b>6</b>
<b>02</b>	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. <b>Perception:</b> Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). <b>Motivation:</b> Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	<b>10</b>
<b>03</b>	<b>Foundations of Group Behavior:</b> The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. <b>Managing Teams:</b> Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. <b>Leadership:</b> Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders	<b>9</b>
<b>04</b>	<b>Organizational Culture :</b> Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	<b>8</b>
<b>05</b>	<b>Organizational Change:</b> Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin’s-Three step model, Seven Stage model of Change & Kotter’s Eight-Step plan for Implementing Change,	<b>7</b>

## Third Semester B.Tech Syllabus For Admission Batch 2015-16

Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley
- 7.

### **PCTX                    STRUCTURE & PROPERTIES OF FIBRES (4-0-0)** **( HONOURS)**

#### **Module - I (14 Hours)**

**Structure of fibres:** Study of structures of natural and man-made fibers – physical, chemical and orphological structures .Molecular conformations – planar zig-zag, helical, lamellar, and sphrulte conformations. Chemical structure of natural fibres-vegetable or cellulosic, animal or polypeptide fibres and man-made fibre, recapitulation of bonding in polymer fibres – primary bonding, secondary bonding.

**Study of fibre structure investigation techniques:** Transmission and Scanning electron microscopes -principle construction and working; X-ray diffraction techniques – X-ray analysis-estimation of crystallinity; Infrared radiation and dichroism. techniques – chemical element and group identification by transmittance and optical density methods. Raman Spectroscopy techniques Molecular orientation estimation, Typical molecular structures of commercially important fibers.

#### **Module - II (14 Hours)**

**Moisture absorption behavior of natural and man-made fibres;** Absolute humidity and relative humidity- moisture content and regain of different fibres-Moisture regains curves, Hygroscopic nature of fibres. Hysteresis in moisture absorption. Equilibrium absorption - Effect of fibre structure – hydrophilic groups and non-crystalline regions on Moisture absorption. Conditioning of fibers –Conditioning process, factors influencing rate of conditioning, effect of conditioning on fibre properties.

**Mechanical Properties of fibres:** Definitions –Load elongation, breaking strength, breaking extension, tensile Stress, tensile strain, mass specific stress, yield point, initial modulus, work of rupture and work factor. Stress-strain curves for various textile fibres and their significance. Mechanical development of large strain. Elastic properties – elasticity, elastic recovery and its relation to stress and strain, work recovery, typical values of elastic recovery and work recovery for various textile fibres. Ways of studying relaxation phenomenon. Mechanical conditioning of fibres – advantages. Time effects – stress relaxation and creep phenomena. Torsional rigidity – its relation to other fibre properties, measurement techniques. Flexural rigidity – its relation to other fibre properties, measurement techniques.

### Module - III (12 Hours)

**Optical properties:** Reflection and Lustre-objective and subjective methods of measurement - refractive index and its measurement - birefringence, factors influencing birefringence - Absorption and dichroism

**Frictional Properties :** Theories of fibre friction- Amonton's law; Measurement: Bowden's model, Capstan's methods; Lindberg's inter fibre friction Yarn to yarn abrasion and friction; friction of wool.

**Thermal properties:** Thermal conductivity, thermal expansion and contraction, structural changes in fibres on heating, heat setting of various synthetic fibres. Specific heat of fibres – theoretical and actual.

**Electrical properties:** Static electricity – generation of static charge and measurement, problems encountered during Processing, elimination techniques. Electrical resistance of fibres, and its measurement, factors influencing electrical resistance. Dielectric properties and its measurement, factors influencing dielectricity.

#### Books Recommended:

1. Meredith R, "The Mechanical Properties of Textile Fibres", North Holland Publishing Co; Amsterdam 1959.
2. Morton W E and Hearle J W S, "Physical Properties of Textile Fibres", 1st reprint, The Textile Institute, Manchester, 1986.
3. Gupta V B and Kothari V K, "Manufactured Fibre Technology", 1st Ed., Chapman and Hall, London, 1997.
4. Hearle JWS, "Polymers and their properties", Vol.I, John Wiley and Sons, NY, 1982.
5. Gedde U W, "Polymer Physics", Chapman Hall, London, 1995.

## **TEXTILE RAW MATERIALS SCIENCE (4-0-0)** **(MINOR SPECIALISATION)**

### Module I ( 05 Hrs)

General definitions and important terminologies related to textiles; Classification of fibres;

Essential and desirable properties of textile fibres, their advantages and disadvantages of natural and manmade fibres.

### Module II ( 08 Hrs)

Cotton: Geographical distribution, concept of ginning & baling, structure and properties (physical and chemical); Different Varieties including organic as well as BT cotton and their properties; Applications.

Bast and leaf fibres such as jute, flax, hemp, sisal and ramie etc: Geographical distribution, extraction, properties and their uses.

**Module III ( 12 Hrs)**

Varieties, sorting and grading of wool, chemical and physical properties of wool, processes involved in the removal of impurities from raw wool; numbering systems of woollen and worsted yarns.

Varieties of natural silk, rearing of silk worm, silk reeling, throwing and weighing properties and uses of various types of silk;

**Module IV( 15 Hrs)**

General principles of manufacturing of man made fibres.

Brief outline of the manufacturing processes of important man-made fibres, viz. rayons (Viscose and Acetate), polynosic, tencel, nylons, polyester, acrylics, polypropylene, polyolefins, polyacrylonitrile and some technical speciality fibres like spandex/lycra etc (only flow charts); their Important physical and chemical properties and applications.

**Books Recommended :**

1. Manmade Fibres - R.W. Moncrieff,
2. Textile Fibre - V.A. Shenai
3. Handbook of Textile Fibres J Gordon Cook
4. Textile Fibres HVS Murthy
5. Manufactured Fibre Technology V B Gupta & V K Kothari
6. Man-made Fibres Science and Technology, Vol. 1,2,3 - H.F. Mark, S.M. Atlas and E. Cernia,
7. Polyester Fibres Chemistry and Technology - H. Ludwig,
8. Textbook of Polymer Science by F.W. Billmeyer.
9. Production of Man-made Fibres – A.Vaidya

## ENVIRONMENTAL ENGINEERING

### **ENVIRONMENTAL CHEMISTRY**

#### **Module-I**

Structure of atmosphere, Properties of Air, Types of Air Pollution Sources: Natural and Anthropogenic Sources, Classification and Chemistry of Major Air Pollutants, Thermodynamics of air pollutants, Atmospheric photochemistry, Chemical and Photochemical Reactions in atmosphere, PAH, VOCs, Acid Rain, Depletion of Stratospheric Ozone. Control of Gaseous Pollutants, Green fuel and their environmental impacts. Principles and Application of Water Chemistry.

#### **Module-II**

Unique Properties of Water, Water Quality Parameters: physico-chemical, biological and bacteriological parameters, Water Quality Criteria and Standards, Water Pollution: Heavy Metal Pollution and its Abatement, Detergents and Phosphates, Eutrophication, Chemical Methods of Water and Wastewater Treatment, Removal of Dissolved Organics and Inorganics, Removal of Nitrogen and Phosphates, Water disinfection, Xenobiotics

#### **Module-III**

Nature and Importance of Soil, Soil Properties, Acid-Base and Ion-exchange Reactions in Soils, Macro and Micronutrients, Colloidal chemistry of Soils, Fertilizers and Other Soil Amendments, Soil Pollution: Heavy Metals and Radio- nuclides in Soil, Degradation of natural substances, Remediation of Metal Contaminated Soil.

#### **Module-IV**

Characteristics of Hazardous Wastes, Classification of Hazardous Wastes, Effects and fate of Hazardous wastes.

#### **Books and References :**

1. Environmental Chemistry - Stanley E. Manahan, 5th Ed., Lewis Publishers, 1995.
2. Chemistry for Environmental Engineering and Sciences (5th Ed)- - CN Sawyer, PL McCarty and GFParkin, Tata McGraw-Hill ed., New Delhi, 2003.
3. Aquatic Chemistry -W.Stumm & JJ Morgan, John Wiley & Sons, Inc, 3rd Ed., NY-1995.
4. Water Chemistry - V.L.Snoeyine and D.Jenkins, John Wiley and Sons, Inc, NY-1980.
5. Principles and Application of Aquatic Chemistry - FMM Morel & JG Hering, John Wiley & Sons, Inc, NY,1993.



## **ENVIRONMENTAL BIOLOGY AND ECOLOGY**

### **MODULE-I**

Ecology, Definition, Branches and Scope of ecology. Ecological adaptation & concept of limiting factor. Different types of ecosystem in India. Structural and functional attributes of an ecosystem. Biotic and Abiotic components, Food chain, Food web and energy flow. Ecological succession. Biogeochemical cycle.

### **MODULE-II**

Concept of population & population attributes. Concept of carrying capacity and environmental resistance. Development and evolution of ecosystem. Population interaction. Qualitative and quantitative characteristic of a plant community.

### **MODULE-III**

Effects of different types of pollution on aquatic biota, Effect of eutrophication. Concept of stress & strain. Definition and function of Biomonitoring. Biotechnology- Fermentation, Vermiculture and Biofertilizer technology.

### **MODULE-IV**

Eco-toxicology: Background, Importance & measurement, Ecosystem response to de-oxygenation, Eutrophication, Pesticides & Bio-accumulation. Ecosystems and the Millennium Development Goals, Landscape ecology. Biodiversity conservation methods: In situ and Ex situ techniques.

### **Text Books & Reference Books:**

1. Fundamentals of Ecology by M.C.Dash & Satya Prakash Dash Tata Mc Graw-Hill Publishing company limited, New Delhi
2. Ecology & Environment by P.B.Sharma – Rastogi Publication.
3. Introduction to Environmental Engg. – G.M.Masters. Prentice Hall of India (1991).
4. Ecology by N .S. Su bramanyan etal - Narosa publishing House, New Delhi.
5. Biological indicators of fresh water pollution and environmental management, Elsevier, London.
6. Environmental pollution monitoring & control - S.M. Khopkar- New Age, New Delhi.
7. Fundamentals of Ecology by E.P. Odum – W.B. Foundation company

## GEOLOGY FOR ENVIRONMENTAL ENGINEERS

### MODULE-I

**Physical Geology:** Branches of Geology, Earth- its origin, internal constitution, and age; Atmosphere, hydrosphere, lithosphere and their constituents; Structural features such as folds, faults, unconformities.; Processes of weathering, Earthquakes, volcanoes; Geological work of river, wind, Overview of toposheets and geological maps and contouring.

### MODULE-II

**Mineralogy:** Minerals: its properties, Properties of common rock forming minerals. Crystals and crystal systems. Classification of minerals and study of common silicate minerals (Quartz, Feldspar, Pyroxene, Mica), sulphide (Pyrite, Chalcopyrite, Galena, Sphalerite) and Oxides (Haematite, Magnetite, Chromite, Pyrolusite, Psilomelane).

**Hydrology:** Aquifers-types; Porosity and Permeability; Delineation of watershed and its characteristics; Calculation of Total Annual Replenish able Recharge value; Overview of Pumping Test studies.

### MODULE-III

**Petrology:** Igneous rocks ; Classification of rocks; Magma- its composition and constitution; Classification of igneous rocks; Description of some common igneous rocks (Peridotite, Dolerite, Basalt, Granite, Rhyolite).

**Sedimentary rocks:** Sedimentation process; Classification and Sedimentary rocks; Description of some common sedimentary rocks (Conglomerate, Sandstone, Shale, Limestone).

**Metamorphic rocks:** Processes of metamorphism;; Description of some common metamorphic rocks (State, Schist, Gneiss, Quartzite, Marble).

### MODULE-IV

**Economic Geology:** Ore and gangue minerals; Mode of occurrence, distribution and uses of some important minerals.

**Coal Geology:** Coal- its composition and origin; Distribution of Indian coals.

**Stratigraphy:** Geological time scale; Various stratigraphic units of India.

**Paleontology:** Fossils- their mode of preservation and uses.

### Books and References :

1. Environmental Geology-DR Coates, John Wiley & Sons, NY 1981
2. The State of India's Environment : A Citizen Report -Anil Agarwal, Vol 1&2., 1985
3. Textbook of Soil Science - Biswas and Mukherjee, TMH, New Delhi, 1994.
4. Reclaimed Land, Erosion Control, Soils and Ecology - Martin J Haigh (ed), A Balkema, 2000.
5. Environmental Geology- Indian Context -KS Valdiya.,Tata McGraw Hill, New Delhi, 1987

## FLUID MECHANICS & HYDRAULICS MACHINES

*Theory L/T (Hours per week): 3/0, Credit: 3*

### Module-I (12 classes)

Introduction - Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid statics - Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer. Hydrostatic pressure on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

### Module-II (10 classes)

Fluid kinematics - Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

### Module-III (8 classes)

Fluid dynamics - Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube. Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

### Module-IV (10 classes)

Hydraulic turbine: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine.

Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.

Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation

Centrifugal Pump: constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

### TEXT BOOKS

1. Fluid Mechanics and Hydraulic Machines, P. N. Modi & S.M Seth, STANDARD BOOK HOUSE
2. A Text Book of Fluid Mechanics and Hydraulic Machines, R.K.Bansal, Laxmi Publications
3. Fluid Mechanics and Machinery, CSP Ojha and P.N. Chandramouli, Oxford University Press
4. Engineering Fluid Mechanics & Hydraulic Machines, K. C. Patra, Narosa Publishing House, Standard Book House

### REFERENCE BOOKS

1. Fluid Mechanics, J. F. Douglas, J. M. Gasiorek, J. A. Swaffield, Pearson Education,
2. Fluid Mechanics, F. M. White, McGraw-Hill
3. Fluid Mechanics Foundations and Application of Mechanics, C.S.Jog, Cambridge University Press
4. Fluid Mechanics and Fluid Machines, Som & Biswas, McGraw Hill
5. Problems in Fluid Mechanics, Subramanyam, McGraw Hill

## MECHANICS OF SOLIDS

*Theory L/T (Hours per week): 3/1, Credit: 4*

### Module-I (12 classes)

Simple Stress and Strain - Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite bars in tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Compound Stress and strain- Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders. Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

### Module-II (10 classes)

Shear Force and Bending Moment for Determinate Beams - Types of load and Types of support. Support reactions, Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams for determinate beams.

### Module-III (10 classes)

Simple Bending of Beams - Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

Deflection of Beams - Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

### Module-IV (8 classes)

Theory of Columns - Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts - Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

### TEXT BOOKS

- 1.Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press
- 2.Strength of Materials by G. H. Ryder, Macmillan Press
- 3.Strength of Materials by R.Subramaniam, Oxford University Press
- 4.Strength of Material by S. S. Ratan, McGraw Hill

### REFERENCE BOOKS

- 1.Mechanics of Materials by Beer and Johnston, McGraw Hill
- 2.Mechanics of Materials by R.C.Hibbeler, Pearson Education
- 3.Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India

### **ENVIRONMENTAL CHEMISTRY LAB (PRACTICAL)**

Analysis of water and wastewater samples

1. Colour and turbidity.
2. Determination of solids
3. Alkalinity, acidity PH.
4. Determination of chloride and conductivity.
5. Estimation of iron.
6. Estimation of Manganese.
7. Determination of Chromium.
8. Determination of sulphate and phosphate.
9. Determination of fluoride.
10. Determination of Ammonia, Nitrite, Nitrate and total kjeldahl nitrogen.

#### **BOOKS:**

1. Standard methods for estimation of water & waste water-APHA, AWWA, WEF-Washington.
2. Examination of water and waste water manual.
3. Manual on water and waste water analysis - NEERI.

### **ENVIRONMENTAL BIOLOGY AND ECOLOGY (PRACTICAL)**

1. Microscopic study of cell divisions (mitosis and meiosis)
2. Microscopic study of tissue systems
3. Extraction of photosynthetic pigments
4. Measurement of water potential
5. Identification of C3 and C4 plants
6. Measurement of qualitative and quantitative characteristics of plant communities
7. Ecological sampling of an area (line transect and quadrat methods)
8. Species-area curve method
9. Field visit of aquatic ecosystem.

### **GEOLOGY FOR ENVIRONMENTAL ENGINEERS (PRACTICAL)**

Toposheet Analysis; Preparation of drainage map; Study through GPS.

Drawing of strike line & determination of true dip & apparent dip. Study of some 26 common minerals. Study of important igneous, sedimentary and metamorphic rocks. Preparation of watershed map and calculation of TARR value. Water table fluctuation study and pumping test analysis.

**FLUID MECHANICS & HYDRAULICS MACHINES LAB**

1. Determination of Metacentric Height
2. Proof of Bernoulli's Theory
3. Determination of Coefficient of Discharge for V-notch
4. Determination of Coefficient of Discharge for Orifice meter
5. Determination of Coefficient of Discharge for Venturimeter
6. Determination of Reynold's Number
7. Friction Flow through Pipes
8. Determination of losses due to bends, fittings and elbows in pipes
9. Impact of Jets
10. Efficiency of Francis Turbine
11. Characteristics of Pelton wheel turbine
12. Discharge through Centrifugal Pump.

## ENGINEERING ECONOMICS

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### Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

### Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

### Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

### Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

## ORGANIZATIONAL BEHAVIOUR

**Credit- 3      Class Hours - 40**

### Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
<b>01</b>	<b>Fundamentals of OB:</b> Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	<b>6</b>
<b>02</b>	<b>Attitude:</b> Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. <b>Personality and values:</b> Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.  <b>Perception:</b> Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). <b>Motivation:</b> Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	<b>10</b>
<b>03</b>	<b>Foundations of Group Behavior:</b> The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. <b>Managing Teams:</b> Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. <b>Leadership:</b> Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders.	<b>9</b>



- 04 Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality. **8**
- 05 Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. **7**  
Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

#### Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

## HONOR SUBJECT

### NUMERICAL AND STATISTICAL METHOD

#### MODULE-I

A.Numerical Methods: Solution of algebraic and transcendental equations by bisection, iteration, false position, secant and Newton-Raphson methods, Generalised Newton's method for multiple roots. Solution of system of linear simultaneous equations by Gauss elimination, Gauss-Jordan, Crout's triangularisation, Jacobi and Gauss-Seidel methods. Finite differences, Symbolic relations, differences and factorial notation of a polynomial, data smoothing, Interpolation and extrapolation, Newton-Gregory forward and backward, Gauss forward and backward, Stirling, Bessel, Everett, Lagrange and Newton's divided difference formulae; Inverse interpolation by Lagrange's and iterative methods; Cubic splines.

#### MODULE-II

Numerical differentiation and integration, Trapezoidal, Simpson's 1/3rd, Simpson's 3/8th, Weddle and Gaussian quadrature formula. Numerical solution of first order ordinary differential equations by Taylor's series, Picard's, Euler's, Modified Euler's, Runge-kutta, Adams-Moulton and Milne's methods. Solution of simultaneous first order and second order ordinary differential equations with initial conditions by Taylor's series, Runge-Kutta and Milne's methods. Numerical solution of boundary value problems by finite difference and shooting methods. Statistical Methods: Concept of frequency distribution: Moments, skewness and kurtosis

#### MODULE-III

Probability: various approaches of probability- classical, frequency (statistical), subjective and axiomatic. Theorems on probability, conditional probability, independence, Bayes theorem. Random variable-discrete and continuous. Distribution functions and their properties, Probability mass and density functions, Mathematical expectation, Moment generating function and its properties. Probability distributions: Bernoulli, binomial, negative binomial, Poisson and normal distributions

#### MODULE-IV

Theory of least squares and curve fitting. Correlation – Simple, multiple and partial, regression lines; regression coefficients; multiple and partial regression. Test of significance: Normal test, t-test chi-square test and F-test.

#### Books and References :

1. Numerical Methods for Scientific & Engg. Computation - MK Jain, SRK Iyenge and RK Jain, 1999
2. Numerical Methods for Mathematics, Science and Engineering - John H Mathews 2000.
3. Applied Numerical Analysis - CF Gerld and PO Wheatley, 2002.
4. Fundamentals of Applied Statistics – S.C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2002. Miller & Friends's
5. Probability and Statistics for Engineers (fifth edition) - Richard A. Johnson.

## MINOR SUBJECT

### ENVIRONMENTAL CHEMISTRY

#### Module-I

Structure of atmosphere, Properties of Air, Types of Air Pollution Sources: Natural and Anthropogenic Sources, Classification and Chemistry of Major Air Pollutants, Thermodynamics of air pollutants, Atmospheric photochemistry, Chemical and Photochemical Reactions in atmosphere, PAH, VOCs, Acid Rain, Depletion of Stratospheric Ozone. Control of Gaseous Pollutants, Green fuel and their environmental impacts. Principles and Application of Water Chemistry.

#### Module-II

Unique Properties of Water, Water Quality Parameters: physico-chemical, biological and bacteriological parameters, Water Quality Criteria and Standards, Water Pollution: Heavy Metal Pollution and its Abatement, Detergents and Phosphates, Eutrophication, Chemical Methods of Water and Wastewater Treatment, Removal of Dissolved Organics and Inorganics, Removal of Nitrogen and Phosphates, Water disinfection, Xenobiotics

#### Module-III

Nature and Importance of Soil, Soil Properties, Acid-Base and Ion-exchange Reactions in Soils, Macro and Micronutrients, Colloidal chemistry of Soils, Fertilizers and Other Soil Amendments, Soil Pollution: Heavy Metals and Radio- nuclides in Soil, Degradation of natural substances, Remediation of Metal Contaminated Soil.

#### Module-IV

Characteristics of Hazardous Wastes, Classification of Hazardous Wastes, Effects and fate of Hazardous wastes.

#### Books and References :

1. Environmental Chemistry - Stanley E. Manahan, 5th Ed., Lewis Publishers, 1995.
2. Chemistry for Environmental Engineering and Sciences (5th Ed)- - CN Sawyer, PL McCarty and GFParkin, Tata McGraw-Hill ed., New Delhi, 2003.
3. Aquatic Chemistry -W.Stumm & JJ Morgan, John Wiley & Sons, Inc, 3rd Ed., NY-1995.
4. Water Chemistry - V.L.Snoeyine and D.Jenkins, John Wiley and Sons, Inc, NY-1980.
5. Principles and Application of Aquatic Chemistry - FMM Morel & JG Hering, John Wiley & Sons, Inc, NY,1993.