

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

Plastic Engineering

<u>3rd Semester</u>				<u>4th Semester</u>			
<i>THEORY</i>		<i>Contact Hours</i>		<i>THEORY</i>		<i>Contact Hours</i>	
<i>Code</i>	<i>Subject</i>	<i>L-T-P</i>	<i>Credits</i>	<i>Code</i>	<i>Subject</i>	<i>L-T-P</i>	<i>Credits</i>
BSCM1205	Mathematics – III	3-1-0	4	BSCM1210	Mathematics – IV	3-1-0	4
BEME2209	Fluid Mechanics & Machines	3-0-0	3	PCPE4202	Polymer Structure & Properties Relationship	3-0-0	3
BSMS1209	Material Sciences	3-0-0	3	PCPE4203	Plastic Materials & Application	3-1-0	4
PCPE4201	Fundamentals of Polymer Science	3-0-0	3	PCPE4204	Additives & Compounding	3-0-0	3
HSSM3204	Engineering Economics & Costing	3-0-0	3	HSSM3205	Organizational Behaviour	3-0-0	3
	OR				OR		
HSSM3205	Organisational Behaviour			HSSM3204	Engineering Economics & Costing		
BECS2212	C++ & Object Oriented Programming	3-0-0	3	BECS2208	Database Management Systems	3-0-0	3
Credits (Theory)			19	Credits (Theory)			20
<i>PRACTICALS/SESSIONALS</i>				<i>PRACTICALS/SESSIONALS</i>			
PCME7202	Mechanical Engineering Lab.	0-0-3	2	PCME7203	Machine Shop and Fabrication Practice	0-0-3	2
	OR				OR		
PCME7203	Machine Shop and Fabrication Practice			PCME7202	Mechanical Engineering Lab.		
BECS7212	C++ & Object Oriented Programming Lab	0-0-3	2	BECS7208	Database Management Systems Lab	0-0-3	2
HSSM7203	COMMUNICATION AND INTERPERSONAL SKILLS FOR CORPORATE READINESS	0-0-3	2	PCPE7202	Polymer Chemistry Lab.	0-0-3	2
Credits (Practicals/ Sessionals)			6	Credits (Practicals/Sessionals)			6
TOTAL SEMESTER CREDITS			25	TOTAL SEMESTER CREDITS			26

BSCM1205 **Mathematics - III**

Module-I

(18 hours)

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, potential.

Module-II

(12 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 –III

(10 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
Reading Chapters: 11,12(except 12.10),13,14,15
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hill Education, 2008
Reading chapter: 18

Reference books:

1. E.B. Saff, A.D.Snyder, "Fundamental of Complex Analysis", Third Edition, Pearson Education, New Delhi
2. P. V. O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

BEME2209 **Fluid Mechanics & 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.

BSMS 1209 **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 Supercoductors.

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.

PCPE4201 **Fundamentals of Polymer Science**

Module-I

Basics of fundamentals of chemistry related to polymers The Science of large molecules Basic concepts of polymer science-History of macromolecular Science-Nomenclature of polymers-Inter molecular forces and chemical bonding in polymers-Thermal transition.

Polymerization

Mechanism and kinetics-Molecular weight and molecular weight Distribution-and its measurements. Effect of Molecular weight on processing and properties.

Module-II

Polymer structure and morphology, Stereochemistry-Molecular interactions Crystalline structure and factors affecting crystallinity - Polymer-Structure property relationship. Physical and chemical methods of modifying polymer properties

Module-III

Reaction of polymers Reaction of polymer with other chemicals-Degradation and stabilisation of polymers.

Polymer characterisation techniques like UV, IR, NMR, DSC, TGA, TMA etc.

Text Books

- 1 Billmeyer Jr.; Fred W., Textbook of Polymer Science, Wiley- Interscience Publishers, New York (1962)
- 2.Fried; Joel R., Polymer Science and Technology, 2nd Edition, Prentice-Hall of India Pvt. Ltd., New Delhi (2003).

Reference Books

3. Ebewele, Robert O., Polymer Science and Technology, CRC Press, Boca Raton (2000).
4. Fried; Joel R., Polymer Science and Technology, Prentice-Hall of India Pvt. Ltd., New Delhi (2000).
5. Ghosh; Premamoy, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (1990).
6. Ghosh; Premamoy, Polymer Science and Technology-Plastics, Rubbers, Blends and Composites, 2nd Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (2002).
7. Kaufmann; H. S. and Falcetta; J. J., Introduction to Polymer Science and Technology, John Wiley and Sons, New York (1977).
8. Kumar; Anil and Gupta; Rakesh K., Fundamentals of Polymers, McGraw-Hill Inc., (International Edition), New York (1998).
9. Kumar; Anil and Gupta; S. K., Fundamentals of Polymer Science and Engineering

HSSM3204 **Engineering Economics & Costing**

Module-I: (12 hours)

Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (**Simple numerical problems to be solved**). Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: (12 hours)

Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

Module-III: (12 hours)

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved) Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

Text Books:

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
2. D.M. Mithani, Principles of Economics. Himalaya Publishing House

Reference Books :

1. Sasmita Mishra, “Engineering Economics & Costing “, PHI
2. Sullivan and Wicks, “ Engineering Economy”, Pearson
3. R.Paneer Seelvan, “ Engineering Economics”, PHI
4. Gupta, “ Managerial Economics”, TMH
5. Lal and Srivastav, “ Cost Accounting”, TMH

HSSM 3205 **Organizational Behaviour**

Module I :

The study of Organizational Behaviour : Definition and Meaning, Why Study OB

Learning – Nature of Learning, How Learning occurs, Learning and OB.

Foundations of Individual Behaviour : Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.

Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Module II :

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness, Groups in Organizations – Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. Leadership-Leadership & Management, Theories of Leadership-Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Follower ship, How to be an effective Leader, Conflict-Nature of Conflict and Conflict Resolution. An Introduction to Transactional Analysis (TA).

Module-III :

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management-Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organisational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

Text Books :

1. Keith Davis, Organisational Behaviour, McGraw-Hill.
2. K.Asawathappa, Organisational Behaviour, Himalaya Publishing House.

Reference Books :

1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
2. Pradip N. Khandelwal, Organizational Behaviour, McGraw-Hill, New Delhi.
3. Uma Sekaran, "Organizational Behaviour", TATA McGraw-Hill, New Delhi.
4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma" Organizational Behaviour" , TATA McGraw- Hill.
5. D.K. Bhattachayya, "Organizational Behaviour", Oxford University Press
6. K.B.L.Srivastava & A.K.Samantaray, "Organizational Behaviour" India Tech
7. Kavita Singh, "Organizational Behaviour", Pearson

BECS2212 C++ & Object Oriented Programming

Module I

(08 hrs)

Introduction to object oriented programming, user defined types, structures, unions, polymorphism, encapsulation. Getting started with C++ syntax, data-type, variables, strings, functions, default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.

Module II

(16 hrs)

Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references.

Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors.

Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.

Operator Overloading: This pointer, applications of this pointer, Operator function, member and non member operator function, operator overloading, I/O operators.

Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration.

Module III

(08 hrs)

Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor.

Template: template classes, template functions.

Namespaces: user defined namespaces, namespaces provided by library.

Text Books:

1. Object Oriented Programming with C++ - E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ - Ashoke N. Kamthane, Pearson Education

Reference Books:

1. Big C++ - Wiley India
2. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
3. C++ and Object Oriented Programming – Jana, PHI Learning.
4. Object Oriented Programming with C++ - Rajiv Sahay, Oxford
5. Mastering C++ - Venugopal, McGraw-Hill Education (India)

PCME7202 **Mechanical Engineering Lab**

Group A

1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Inertia of Flywheel
3. Determination of tensile strength of materials by Universal Testing Machine.

Group B

4. Determination of Metacentric Height and application to stability of floating bodies.
5. Verification of Bernoulli's Theorem and its application to Venturimeter.
6. Determination of Cv and Cd of Orifices.

Group C

7. Calibration of Bourdon Tube Pressure gauge and measurement of pressure using manometers.
8. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
9. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.

BECS7207 **C++ & Object Oriented Programming Lab**

1. Programs on concept of classes and objects.(1 class)
2. Programs using inheritance.(1 class)
3. Programs using static polymorphism.(1 class)
4. Programs on dynamic polymorphism.(1 class)
5. Programs on operator overloading.(1 class)
6. Programs on dynamic memory management using new, delete operators.(1 class)
7. Programs on copy constructor and usage of assignment operator.(1 class)
8. Programs on exception handling .(1 class)
9. Programs on generic programming using template function & template class.(1 class)
10. Programs on file handling.(1 class)

HSSM7203 **Communication & Interpersonal skills for Corporate Readiness Lab.**

Lab

30 hours

This course will focus on communication in professional (work-related) situations of the kind that BPUT graduates may expect to encounter on entering the professional domain.

Some typical forms of work-related communication, oral or written, are listed below. Practice activities for all four skills can be designed around these or similar situations.

1. Gaining entry into an organization
 - i. Preparing job-applications and CVs
 - ii. Facing an interview
 - iii. Participating in group discussion (as part of the recruitment process)
- 2 In-house communication
 - a. Superior/ Senior → subordinate / junior (individual → individual / group)
 - i. Welcoming new entrants to the organization, introducing the workplace culture etc.
 - ii. Briefing subordinates / juniors : explaining duties and responsibilities etc.
 - ii. Motivating subordinates / juniors ('pep talk')
 - iii. Instructing/ directing subordinates/ juniors
 - iv. Expressing / recording appreciation, praising / rewarding a subordinate or junior
 - v Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking for an explanation etc.
 - b. Subordinate / Junior → Superior / Senior
 - i. Responding to the above
 - ii. Reporting problems / difficulties / deficiencies
 - iii. Offering suggestions

BSCM1210 **Mathematics – IV****Module-I (20 hours)****Numerical methods:**

Approximation and round of errors, Truncation error and Taylor's series

Roots of equation: The bisection method, the false-position method, fixed point iteration, the Newton-Raphson method, Muller's method

Linear algebraic equation: LU decomposition, the matrix inverse, Gauss-Seidel method

Interpolation: Newton divided difference interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss quadrature

Ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods

Module-II (10 Hours)**Probability:**

Probability, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson and Hypergeometric distributions, Normal distribution, Distribution of several random variables.

Module-III (10 Hours)**Mathematical Statistics:**

Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis, Acceptance sampling, Chi square test for goodness of fit, Regression Analysis, Fitting Straight Lines, Correlation analysis.

Text books:

1. S. C. Chapra and R. P. Canale, "*Numerical methods for Engineers*", Fifth Edition, McGraw Hill Education
Reading Chapters : 2, 3(3.1, 3.2), 4(4.2, 4.3), 5(5.1, 5.2, 5.3), 6(6.4), 9(9.1, 9.2), 10(10.2), 13(13.1,13.2,13.5), 16(16.1, 16.2), 17(17.3), 20(20.1, 20.2, 20.3)
2. E. Kreyszig," *Advanced Engineering Mathematics*:", Eighth Edition, Wiley India
Reading Chapters: 22, 23(except 23.5 and 23.8)

Reference books:

1. Jay L. Devore, "*Probability and Statistics for Engineering and Sciences*", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd
2. P. V.O'Neil, "*Advanced Engineering Mathematics*", CENGAGE Learning, New Delhi

PCPE4202 **Polymer Structure and Property Relationship**

Module-I

Structure of polymers - Linear, branched, cross linked, and network polymers - Homochain and hetero atomic chain polymers - Copolymers - Linear and cyclic arrangement - Prediction of polymer properties, group contribution techniques, topological techniques- Volumetric properties - molar volume, density, Van der Waals volume - Coefficient of linear thermal expansion and volumetric thermal expansion - Pressure volume temperature (PVT) relationship.

Mechanical properties - Stress-strain properties of polymers - Effect of polymer structure on modulus of elasticity, tensile strength, flexural strength, impact strength, yield strength, fracture toughness - Crazing in glassy polymers - Ductile brittle transition. Effect of additives on mechanical properties of polymers - Creep, stress relaxation, and fatigue.

Module-II

Thermodynamic and transition properties - Transition temperature in polymers, glass transition (T_g), melt transition (T_m), relationship between T_g and T_m - other transitions like β -transitions, upper and lower glass transition temperatures - Prediction of T_g and T_m of polymers by group contributions. Calorimetric properties - Heat capacity, specific heat, latent heat of crystallization and fusion, enthalpy and entropy - Calculation of heat capacities of polymers.

Module-III

Electrical and optical properties - Effect of polymer structure on dielectric constant, power factor, dissipation factor, and loss factor - effect of frequency of voltage and temperature on dielectric properties - Prediction of molar polarization and effective dipole moment. Effect of additives on electrical properties of polymers. Optical properties - Effect of polymer structure on optical properties - clarity, transparency, haze, transmittance, reflectance, and gloss -Prediction of refractive indices of polymers by group contributions

Chemical Properties - Cohesive energy, cohesive energy density, solubility parameter, determination of solubility parameter of polymers - Prediction of solubility parameter -Effect of polymer structure on solubility in solvents and oils - Influence of structure in prediction of flame retardancy, water repellency - Chemical resistance of polymers - Polymer toxicity

Total Lectures = 45 Tutorials = 15

References Books

1. D.W. Van Krevelen And P.J. Hoftyzen, "Properties Of Polymer , 3rd Edition Elsevier Scientific, Publishing Company Amsterdam - Oxford - Newyork. 1990.
2. J.E. Mark Ed.AIP, Physical Properties Of Polymers Hand Book, Williston, Vt, 1996.

PCPE4203 **Plastic Materials and Applications**

Module-I

History-basic chemistry of polymers-nomenclature of polymers sources for raw materials- methods of manufacturing-general properties-processing behavior and applications - of the following:

Natural Polymers : Shellac resin and natural rubber.

Thermoplastics & its Applications

Commodity plastics & its applications

1. Polyolefin - Polyethylene, LDPE, HDPE, LLDPE, HMHDPE, Polypropylene
Homo-polymers- Copolymers.
2. Polytyrene & Styrene copolymers - Polystyrene, HIPS, ABS, Styrene
Acrylonitrile
3. Vinyl plastics - Polyvinyl chloride, Polyvinyl Acetate, Polyvinylidene chloride,
Polyvinyl alcohol & others.
4. Cellulosics -Cellulose nitrate, cellulose acetate, cellulose acetate butyrate,
Ethyl cellulose & others.

Module-II

Engineering Plastics & its Applications

UHMHDPE -EPDM - EVA

Polyamides - Nylons 6, 66, 6 10, 11, 12 etc.

Polyimides - Polyimidazoles.

Acrylic plastics - Polymethyl Methacrylate, Polyacrylonitrile.

Polyesters - Polyethylene terephthalate, polybutylene terephthalate.

Polycarbonate

Polyacetals - Polyoxymethylene

Aromatic ether - Polyphenylene oxide

Aromatic thioether - Polyphenylene sulphide

Polysulfone

Polyurethane

Fluoropolymers - Polyvinyl fluoride, Polyvinylidene fluoride, Polytetrafluoroethylene, Polychlorotrifluoroethylene.

Thermoplastic Elastomers

Speciality polymers viz.PEEK, polyimides, PAI & Ionomer

Liquid Crystalline Polymers

Metallocene Polymers

Thermoset materials & its Applications

Phenol formaldehyde - Urea formaldehyde - Melamine formaldehyde – Unsaturated polyesters, Alkyd resins -

Epoxides - Polyurethane - Silicones

End use applications - case studies on applications (6 hours)

Module-III

Polymer blends and Alloys

Definition, advantages of polymers, blends and alloys, role of composition, properties and applications of parameters for compability, PVC – Nitrile rubber, ABS-PVC and PP-EPDM

Preleminary concepts of new materials such as electrically active polymers, Optoelectronic plastics, Bio-polymers, membrane plastics in bio medical applications. Polymer Concretes & Advanced ceramics. Reinforced Plastics – principles of composite reinforcement, effect of reinforcement on strength of plastics, Role and nature of binders and coupling agents, properties and applications of fibres in reinforcement (glass and carbon), Properties and applications of FRP's (Thermoset & Thermoplastics: un-saturated polyesters, epoxies, PU, nylon) .

Text Books

1. Plastic Materials Ed 7 - By Brydson, J.A
2. Hand Book of Plastics Materials & Technology - By Rubin, Irwin, J
3. Plastics Materials Hand Book - By Athalye, A.S

Reference Books

1. Plastics Engineering Hand Book Ed. 5 & Society of the Plastic Industry Inc - By SPI.
2. Plastics Materials and Processing - By Schwartz & Goodman
3. Plastics Materials (Properties & Application) - By Birley & Scott
4. Modern Plastics Hand Book - By Harper
5. Bikales; Norbert M. and Segal; Leon (Eds.), Cellulose and Cellulose Derivatives, Part IV (Volume V), Wiley- Interscience, New York (1971).
6. Birley; Arthur W. and Scott; Martyn J., Plastics Materials: Properties and Applications, Leonard Hill, Blackie and Sons Ltd., (1982)
7. Biron; Michel, Thermoplastics and Thermoplastic Composites: Technical Information for Plastics Users, Elsevier, Amsterdam (2007)
8. Davidson; Theodore, Polymers in Electronics, ACS Symposium Series 242, American Chemical Society, Washington D. C. (1984).
9. DuBois; P., Plastics in Agriculture, Applied Science Publishers Ltd., London (1978)

PCPE4204 Additives and Compounding

Module-I

Additives for plastics

Fillers-Antioxidants-Thermal Stabilizers, Lubricants-Plasticizers, Toughening-agents-Colourants-Fire retardants-Coupling agents-blowing-agents-Ultraviolet stabilizer-Antistatic agents-Anti blocking agents-Slip and antislip agents-processing aids-mould releasing agents.

Module-II

Compounding - Selection of polymers and compounding-ingredients-general objectives-possibilities and limitation of additives into polymer matrices.

Module-III

Mixing and mixing equipments.

Machine construction - specifications - temperature control system - operating characteristics - house keeping and maintenance of compounding machines.

Case studies on preference of one plastics to other and co-relation of properties of conventional materials and blends and alloys - case studies on application of blends and alloys.

Text Book

1.Polymer additives –by Muller

Reference Books

1. Al – Malaika; S. Golovoy; A and Wilkie (Eds), Chemistry and Technology of Polymer Additives, Black well Science Ltd, Oxford (1999)
2. Matthews; F.L. and Rawlings; R.D, Composite Materials, Engineering and Science Chairman and Hall, London (1994)
3. Plastics Testing Technology Hand Books by Vishu Shah
4. Hand Book of Plastics Test Methods by Brown R.P
5. Mascia; L.,The Role of Additives in Plastics, Edward Arnold Publishers Ltd., U. K. (1974).
6. Murphy; John, Additives for Plastics Handbook, 2nd Edition, Elsevier Advanced Technology, Oxford.

BECS2208 **Database Management System**

Module I : (10 hours)

Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages. Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

Module II : (12 hours)

Relation Query Languages, Relational Algebra and Relational Calculus, SQL.

Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design.

Query Processing Strategy.

Module III: (10 hours)

Transaction processing: Recovery and Concurrency Control. Locking and Timestamp based Schedulers.

Database Recovery System: Types of Data Base failure & Types of Database Recovery, Recovery techniques

Text Books:

1. Database System Concepts by Sudarshan, Korth (McGraw-Hill Education)
2. Fundamentals of Database System By Elmasari & Navathe- Pearson Education

References Books:

- (1) An introduction to Database System – Bipin Desai, Galgotia Publications
- (2) Database System: concept, Design & Application by S.K.Singh (Pearson Education)
- (3) Database management system by leon &leon (Vikas publishing House).
- (4) Fundamentals of Database Management System – Gillenson, Wiley India
- (5) Database Modeling and Design: Logical Design by Toby J. Teorey, Sam S. Lightstone, and Tom Nadeau, “”, 4th Edition, 2005, Elsevier India Publications, New Delhi

PCME7203 **Machine Shop and Fabrication Practice**

1. A job on lathe with taper turning, thread cutting, knurling and groove cutting
2. Gear cutting (with index head) on milling m/c
3. Working with shaper, planer and slotting m/c
4. Working with surface/ cylindrical grinding
5. TIG/ MIG welding, gas cutting

BECS7208 Database Managements System Lab

1. Use of SQL syntax: insertion, deletion, join, updation using SQL. (1 class)
2. Programs on join statements and SQL queries including where clause. (1 class)
3. Programs on procedures and functions. (1 class)
4. Programs on database triggers. (1 class)
5. Programs on packages. (1 class)
6. Programs on data recovery using check point technique. (1 class)
7. Concurrency control problem using lock operations. (1 class)
8. Programs on ODBC using either VB or VC++. (1 class)
9. Programs on JDBC. (1 class)
10. Programs on embedded SQL using C / C++ as host language. (1 class)

PCPE7202 Polymer Chemistry Lab.

Experiments:

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

A.PLASTICS

Polyethylene
Polypropylene
Polystyrene
Polyvinyl Chloride
Polyamide
Polyethylene terephthalate
Polybutylene terephthalate
Polycarbonate
Polyacetal
Polyphenylene oxide
Polyphenylene sulphide
Phenol Formaldehyde
Urea formaldehyde
Melamine formaldehyde

B. Identification of Rubbers by Simple Methods

Natural Rubber (NR) Polybutylene Rubber (BR) Styrene Butadiene Rubber (SBR) Isoprene Rubber (IR)
Isobutylene Isoprene Rubber (IIR) Chloroprene Rubber (CR) Acrylonitrile – Butadiene Rubber (NBR)
Silicone Rubber

Total: 90

Text Books

- 1.Plastics Testing Technology Hand Books by Vishu Shah
- 2.Hand Book of Plastics Test Methods by Brown R.P

Reference Books

1. Identification of plastics and rubbers by simple methods, CIPET publications 2002.
