BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

Biotechnology Engineering

3rd Semester

Theory **Contact Hours**

Code	Subject	L-T-P	Credit
BSCM1205	Mathematics - III	3- 1- 0	4
BSCP1206	Physics II	3- 0- 0	3
	OR		
BSCP1207	Physics of Semiconductor Devices		
BECS2212	C++ & Object Oriented Programming	3- 0- 0	3
HSSM3204	Engineering Economics& Costing	3- 0- 0	3
	OR		
HSSM3205	Organisational Behavior		
BEME2209	Fluid Mechanics & Machines	3- 0- 0	3
PCBT4201	Biochemistry	3- 0- 0	3
	Theory Credits	**19**	

Practical/ Sessional

HSSM7203	COMMUNICATION AND INTERPERSONAL SKILLS FOR CORPORATE READINESS	0- 0- 3	2
BECS7212	C++ & Object Oriented Programming Lab	0- 0- 3	2
PCBT7201	Biochemistry Lab	0- 0- 3	2
PCME7202	Mechanical Engg. Lab	0- 0- 3	2

TOTAL SEMESTER CREDITS 27

4th Semester

Theory **Contact Hours**

Code	Subject	L-T-P	Credit
PCBT4202	Cell Biology & Genetics	3- 1- 0	4
BSCC1208	Chemistry II	3- 0- 0	3
	OR		
BSMS1209	Material Sciences		
BECS2208	Database Management System	3- 0- 0	3
HSSM3205	Organisational Behavior	3- 0- 0	3
	OR		
HSSM3204	Engg. Economics & Costing		
PCBT4203	Micro Biology	3- 1- 0	4
PCBT4204	Molecular Biology	3- 1- 0	3
	Theory Credits		**20**

Practical/ Sessional

BECS7208	Database Management System Lab.	0- 0- 3	2
PCBT7204	Cell & Molecular Biology Lab	0- 0- 3	2
PCBT7203	Microbiology Lab	0- 0- 3	2

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.Snider, " Fundamental of Complex Analysis", Third Edition, Pearson Education, New Delhi
2. P. V. O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

BSCP1206 **PHYSICS-II**

This one semester physics course is divided into three (Modules). Module-I deals with some aspects of nuclear accelerators, Module-II introduces certain features of condensed matter physics and Module-III deals with certain aspects of fibre optics and different types of lasers and crystal defects.

Module-I

This unit covers the basic principles and applications of different types of accelerators and their important applications.

Need for nuclear accelerators.

D.C. Accelerators: Cockcroft-Walton, Van de Graff, Tandem accelerators.

R.F. Accelerators: Linear accelerators, cyclotrons, electron accelerator, betatron.

Application of nuclear accelerators - Production of radio isotopes, Radiation processing of materials, medical applications.

This unit covers the basic principle, properties of nanoparticles.

Nanoparticles.

Properties, Classification & characterization of nanoparticles, fabrication of nanoparticles, Structure of carbon nanotubes, types of carbon nanotubes, Properties of (Electrical, thermal) carbon nanotubes, Quantum Dots.

Module-II

Study of crystal structure by diffractions methods, Bragg's condition for crystal diffraction, Laue's Condition, Miller indices, Reciprocal laltice, Geometrical Structure factor, Atomic form factor.

Energy bands in solids: Kronig-Penney model, allowed bands and forbidden gaps, elemental and compound semiconductors.

Superconductivity: Superconductors and their properties, Meisner's effect, Type-I and Type-II superconductors, thermodynamic properties of superconductors, London equation, Application of superconductors

Module-III

Defects in crystal:-Schottky and Frenkel defects, color centres, dislocation.

Laser: - Principle of lasing, Properties of laser, Ruby laser, He-Ne laser, semiconductor laser(construction and working). Application of laser.

LED: Principle, construction of operation and application, Introduction to fiber optics, basic characteristics of optical fibers, optical fibre communication system.

Books Recommended

Text books

(1) Concepts in Engineering Physics,Md.N.Khan
(2) Physics-II, B.B.Swain, P.K.Jena.

Reference Books

(3).Principles of Nanotechnology, Phani Kumar
(4) Physics-II, Randhir Singh, Shakti Mohanty,
(5) Physics-II, A.Serway,W.Jewett
(6) Solid state Physics, W.Ashcroft, N.David Mermin,
(7) Introduction to Solid State Physics, C.Kittel,
(8) Solid State Physics, Dan Wei

BSCP 1207 **Physics of Semiconductor Devices**

Module-I (10 Hours)

1. **Introduction to the quantum theory of solids**: Formation of energy bands, The k-space diagram (two and three dimensional representation), conductors, semiconductors and insulators.
2. **Electrons and Holes in semiconductors:** Silicon crystal structure, Donors and acceptors in the band model, electron effective mass, Density of states, Thermal equilibrium, Fermi-Dirac distribution function for electrons and holes, Fermi energy. Equilibrium distribution of electrons & holes: derivation of *n* and *p* from D(E) and f(E), Fermi level and carrier concentrations, The *np* product and the intrinsic carrier concentration. General theory of *n* and *p*, Carrier concentrations at extremely high and low temperatures: complete ionization, partial ionization and freeze-out. Energy-band diagram and Fermi-level, Variation of E_F with doping concentration and temperature.
3. **Motion and Recombination of Electrons and Holes:** Carrier drift: Electron and hole mobilities, Mechanism of carrier scattering, Drift current and conductivity.

Module II (11 Hours)

4. **Motion and Recombination of Electrons and Holes (continued):** Carrier diffusion: diffusion current, Total current density, relation between the energy diagram and potential, electric field. Einstein relationship between diffusion coefficient and mobility. Electron-hole recombination, Thermal generation.
5. **PN Junction:** Building blocks of the pn junction theory: Energy band diagram and depletion layer of a pn junction, Built-in potential; Depletion layer model: Field and potential in the depletion layer, depletion-layer width; Reverse-biased PN junction; Capacitance-voltage characteristics; Junction breakdown: peak electric field. Tunneling breakdown and avalanche breakdown; Carrier injection under forward bias-Quasi-equilibrium boundary condition; current continuity equation; Excess carriers in forward-biased pn junction; PN diode I-V characteristic, Charge storage.
6. **The Bipolar Transistor:** Introduction, Modes of operation, Minority Carrier distribution, Collector current, Base current, current gain, Base width Modulation by collector current, Breakdown mechanism, Equivalent Circuit Models - Ebers -Moll Model.

Module III (12 Hours)

7. **Metal-Semiconductor Junction:** Schottky Diodes: Built-in potential, Energy-band diagram, I-V characteristics, Comparison of the Schottky barrier diode and the pn-junction diode. Ohmic contacts: tunneling barrier, specific contact resistance**.**
8. **MOS Capacitor:** The MOS structure, Energy band diagrams, Flat-band condition and flat-band voltage, Surface accumulation, surface depletion, Threshold condition and threshold voltage, MOS C-V characteristics, Q_{inv} in MOSFET.
9. **MOS Transistor:** Introduction to the MOSFET, Complementary MOS (CMOS) technology, V-I Characteristics, Surface mobilities and high-mobility FETs, JFET, MOSFET V_t, Body effect and steep retrograde doping, pinch-off voltage,

Text Books:

1. Modern Semiconductor Devices for Integrated Circuits, Chenming Calvin Hu, Pearson Education/Prentice Hall, 2009.
2. Semiconductor Physics and Devices, 3rd Edition, Donald A. Neamen, Tata McGraw Hill Publishing Company Limited, New Delhi.

Reference Books:

1. Fundamentals of Semiconductor Devices, M.K. Achuthan and K.N. Bhatt, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Solid State Electronics Devices, 6th Edition, Ben. G. Stretman and Sanjay Banarjee, Pearson Educ, New Delhi.
3. Physics of Semiconductor Devices, 3rd Edition, S.M. Sze and Kwok K. Ng, Wiley India Pvt. Limited, New Delhi.
4. Physics of Semiconductor Devices, 2nd Edition, Dillip K. Roy, University Press (India) Pvt. Ltd., Hyderabad.
5. Solid State Electronics Devices, D.K. Bhattacharya and Rajnish Sharma, Oxford University Press, New Delhi.

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)
6. “Object Oriented Programming with C++”, David Parsons, Cengage Learning.

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.

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 : Defination and Meaning, Why Study OB
Learning – Nature of Learning, How Learning occurs, Learning and OB.
Foundations of Individual Behaviour : Personality – Meaning and Defination, 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 Followership, How to be an effective Leader, Confict-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.Aswathappa, 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

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.

PCBT4201 **Biochemistry**

Module-I **(16 Hr.)**

Introduction to Biomolecules:
Structure and Function of Carbohydrates: Monosaccharide, Oligosaccharides, Polysaccharides (Starch, Glycogen, Cellulose), Optical Isomerism;
Structure and Function of Lipids: Saturated and Unsaturated Fatty Acids, Triacylglycerols, Phosphoglycerides, Sphingolipids, Waxes and Sterol;
Structure and Function of Proteins: 20 Amino acids, Peptide bond, Hierarchy of protein architecture, Ramachandran Plot, 3-D structure;
Structure and Function of Nucleic Acids: DNA, RNA, Double Helix Model of DNA, Denaturation and Renaturation DNA;
Structure and function of Hormones, Minerals and Vitamins; Bio-complexes: Nucleoproteins, Glyco-proteins, Lipoproteins and Vitamin complexes.

Module-II **(12Hr.)**

Principle of Bioenergetics: Bioenergetics and Thermodynamics; Phosphoryl group transfer and energy currency-ATP; Biological Oxidation and reduction reactions
Metabolism-I: Introduction to metabolic processes;
Metabolism of Carbohydrates: Glycolysis, TCA Cycle, ETS and Oxidative Phosphorylation, HMP pathway, Gluconeogenesis , Glycogen metabolism;
Metabolism of Lipids: Anabolism (Saturated and Unsaturated), Catabolism (α- Oxidation, β-Oxidation) and Energetics of lipid metabolism;
Metabolism Of Nucleic Acids: Catabolism and anabolism of purine and pyrimidine nucleotides.

Module-III **(12Hr.)**

Metabolism-II: Metabolism of proteins: Properties of Amino acids, Biosynthesis of amino acids (Valine, Serine, Histidine and Glutamic Acid); Protein Catabolism (Genetic code and Protein synthesis); Protein Turnover, Protein Targetting.
Enzymes: Properties of Enzyme, Classification of Enzymes, Mechanism of enzyme action, Kinetics of of enzyme action, Activation energy, Enzyme Inhibition, Coenzyme, Apozyme and Holozyme

Text Book

1. Principle of Bio-Chemistry – Lehinger, Nelson and Cox
2. Biochemistry of Biochemistry by L. Stryer
3. Fundamentals of Biochemistry – Voet & Voet
4. Biochemistry by Zubay.
5. Biochemistry, C.B.Powar & G.R.Chatwal, Himalaya Publishing House.
6. Biochemistry, Rastogi, Tata McGraw Hill.

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

Offering suggestions

BECS7212 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)

PCBT7201 **Biochemistry Lab**

1. Spectrophotometric/Colorimetric estimation of Protein using Lowry's Method
2. Spectrophotometric estimation of DNA using DPA method
3. Spectrophotometric estimation of RNA using Orcinol Method
4. Estimation of iodine Number and Saponification value of fatty acids
5. Separation of Amino acids by Paper Chromatography
6. Separation of Sugars by Thin Layer Chromatography
7. Separation of Proteins by SDS-PAGE
8. Assay of Enzyme activity: Protease from bacteria
9. Assay of Enzyme activity: Amylase from Plant tissue & Saliva
10. Determination of Km and Vmax of an enzyme catalyzed reaction.

Books:
Introduction to Practical Biochemistry, Plummer, Tata McGraw Hill

PCME7202 **Mechanical Engg. 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.

4th Semester

PCBT4202 Cell Biology and Genetics

Module-I **(12 Hr.)**

Organization of Cell (Prokaryotic and Eukaryotic), Cell Wall & Cell Membrane, Cell Organelles (Plastid, Golgibodies, Mitochondria, Ribosome), Nucleus, Cytoskeleton, Cell Cycle, Cell Divisions- Mitosis and Meiosis, Molecular Organization of Chromosome (Nucleosome concept), Cell-cell signaling(G-protein and Receptor mediated).

Module-II **(16Hr.)**

Principles of Inheritance: Chromosome theory of Heredity, Mendelism, Non-Mendelian Gene Interactions (Epistasis, Lethality, Pleiotropy), Allelic Complementation, Linkage and Crossing over, Chromosome mapping, Coincidence and Interference, Cytoplasmic Inheritance, Sex Determination, Mutation and Chromosomal Aberration, Transposable genetic elements, Principles breeding in plants and animals, Heterosis and Hybrid vigour, Inbreeding depressions, Genetic diseases in Human (Colour blindness, Haemophillia).

Module-III **(12Hr.)**

Quantitative Inheritance: Polygenes and Multiple alleles, Introduction to QTLs and its inheritance, Detection of QTLs

Population Genetics: Hardy-Weinberg's law, Genetic Equilibrium, Changes in gene frequency, Genetic Drift, Effect of evolutionary forces on genetic equilibrium of apopulation.

Developmental genetic with reference to Arabidopsis and Drosophilla.

Text Books

1. Theory & Problems in Molecular & Cell Biology, Stansfield, Tata McGraw Hill
2. The Cell Molecular approach, Geoffrey M. Cooper, ASM press Washington D.C. Sinauer Associates, Inc.
3. Principles of Genetics, Robert Tamarin, Tata McGraw Hill
4. Molecular Biology of Cell – Alberts, Garland Science, Taylor & Francis Group.
6. Concept of Genetics by Klug.
7. Genetics, David R Hyde, Tata McGraw Hill.

BSCC1208 **Chemistry - II**

Module I

1.Water Technology: Hardness of Water : Types of hardness, Units of hardness and their interrelation, Determination of hardness(EDTA method only). Disadvantage of hard water . Water softening technology (internal and external (limesoda,zeolite,and ion exchange methods) Desalination(electrodialysis, reverse osomosis, Sterilization of water by bleaching power, chlorine, ozone, chloramine. Determination of B.O.D and C.O.D of water sample.

2.Corrosion: Theories of corrosion , Types of corrosion , Factors affecting corrosion, Corrosion Control: (Proper design and fabrication procedure, Cathodic protection, Passivation).

MODULE-II

1. **Fuels**: Classification of fuels, calorific value, (Determination by Dulong's formula),G.C.V&N.C.V

Liquid fuel: Classification of petroleum, Refining of petroleum , Cracking, Knocking and anti knocking,cetane and octane numbers . Unleaded petrol, synthetic petrol, power alcohol

Gaseous Fuel : Producer gas, Water gas, LPG , CNG, Kerosene gas

Combustion Calculation.

2.Battery technology

Introduction, Batteries and cells, Basic components of battery, its Classification characteristics,Chemical batteries(dry, Lead acid & gel batteries) Alkaline batteries(zinc-air,aluminium-air,Nickel metal hydride battery) Reserve batteries(magnesium-copper,Gordan-magnesium battery) Nickel cadmium battery

Module III

1.POLYMER . Polymer: Types, polymerization process and mechanisms

Conducting polymers(poly aniline, poly acetylene),polymer composite(carbon fiber)

Preparation. Properties and uses of following polymer(polyethylene,PMMA,PTFE

Bakelite,polyurethanes,polycarbonate)

2 Nano materials

Nano material; Carbon nano tube,(synthesis, properties and application.) Application of nano material in medicine, fuel cell, catalysis (only general idea)

Text Books:

1.Engineering chemistry by Putti R.vIjayasararhy ,PHI Ltd

2. Engineering chemistry by P.C jain and M. jain

Reference Books:

1. Engineering chemistry by N Krishnamurthy ,p vallinaygam, Dmadhavan, PHI Ltd
2. Engineering chemistry by mary,jane.shultz ,Cengage learning publication
3. Engineering chemistry by R.Gopalan,D.venkaapaya,and SNagarajan, Vikas publishing house.

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.

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

PCBT4203 **Micro Biology**

Module-I (10 Hr.)

Introduction to Microbial Kingdom- Bacteria, Viruses, Fungi and Yeast; Classical and Modern approaches of microbial taxonomy; Classification of bacteria, fungi and Viruses; Methods of Microbiology- Culture media, Sterilization, Establishment of pure culture, Staining of bacteria (Gram's, Acid Fast, Capsule), Micrometry and Microscopy(Bright Field, Fluorescence, Phase Contrast and Electron).

Module-II (16Hr.)

Microbial growth and metabolism: Pattern of bacterial growth, Growth kinetics, Monod's Equation, Synchronous Growth and its Kinetics, Continuous culture and its growth kinetics, Growth inhibitory substances. Metabolism of carbohydrate in bacteria, Enerdoudorf,s pathway and glyoxalate pathway, Energy transduction mechanism in bacteria, Cyanobacteria and nitrogen fixation, Anaerobic respiration.

Microbial genetics: Organization of bacterial and viral genome, Plasmids and Episomes, Genetic recombination in bacteria (Transformation, Conjugation and Transduction), Genetic analysis in bacteria, DNA repair mechanisms in bacteria, Transposons, Mutation in Microorganisms.

Module-III (14Hr.)

Food Microbiology: Microbiology of foods, Types of microbes associated with food spoilage, Food preservation methods, Food poisioning, Microbiology of Milk and dairy products.

Medical Microbiology: disease causing bacteria, virus and fungi; Antimicrobial agents, Antibiotics, Disinfectants and Vaccines

Environmental Microbiology: Microbiology of water, Microbiology of Air, Baceriological analysis of water & water treatment, Microbiology of extreme environments (Halobacteria, Methanogens, Thermofiles), Microbiology of sewage.

Text Books :

1. Text book of Microbiology by Stanier.
2. Microbiology, R.S. Mehrotra, Tata McGraw Hill
3. Microbiology by Pelczar
4. Brock Biology of micro-organisms
5. Microbiology by Presscort.
6. Microbial Genetics- Freifelder
7. Mol. Genetic of bacteria by R. Snyder
8. Microbiology by Atlas
9. Microbiology by Devis

PCBT4204 **Molecular Biology**

Module-I (16 Hr.)

Genome Organization Prokayotes and Eukaryotes, Nuclear genome and Organellar genome, DNA as the genetic material, Central dogma of molecular biology, Genome complexity, C- value Paradox, Cot curve analysis, Repetitive DNA, satellite DNA; Gene structure in prokaryotes and Eukaryotes, Cistron, Recon, Muton; Variants of gene- Split genes, pseudogenes, Overlapping genes and selfish DNA.

DNA Replication: Models of DNA replication, Enzymology of DNA replication, Process of DNA replication (Initiation, Elongation, Termination), DNA replication at the telomere, Replication of Mitochondrial and Chloroplast genome, DNA-protein interaction, DNA repair.

Module-II (10Hr.)

Transcription: Components of transcription machinery in prokaryotes and eukaryotes, Transcription factors, Transcription process (Initiation, Elongation, Termination), Transcription factors, m-RNA processing, Pre and Post transcriptional processing, Capping and poly (A) tailing, m-RNA stability, m-RNA editing, Gene Silencing

Module-III (14Hr.)

Translation: Genetic code- the principle of translation, Translation machinery (t-RNA, Aminoacyl synthetase, Ribosome), Translation process, Post translational modification of protein.

Regulation of Gene Expression: Constitutive and Induced gene expression, Regulation of gene expression in prokaryotes and eukaryotes, Operon model (Lac-operon and Trp- operon), DNA methylation.

Molecular evolution (DNA based phylogenetic trees and its applications), Introduction to recombinant DNA technology.

Books :

1. Text Book of Molecular Biology By Padmanabhan and Shastri.
2. MOLBIO – Avinash & K. Upadhyaya, Himalaya Publishing House.
2. Mol. Biology. by Turner.
3. Mol. “Biology of Gene” – Watson
4. Principles of Mol. Biology - OS Prim Rose
5. Recombinant DNA Technology – Watson
6. Mol. Cell Biology. - Baltimore

BECS7208 **Database Management 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)

PCBT7204 **Cell and Molecular Biology Lab.**

1. Chromosome preparation from onion root tip (Mitosis) & grasshopper testis (Meiosis).
2. Isolation, purification of DNA from plant sample and its yield estimation.
3. Isolation, purification of DNA from blood sample and its quantification using UV spectrophotometer.
4. Isolation, purification of DNA from bacterial sample and its quality assessment using UV spectrophotometry.
5. Isolation of plasmid DNA and estimation its size using agarose gel electrophoresis.
6. Effect of gel concentration on solidification and migration of DNA sample
7. Restriction digestion of supplied DNA sample and estimate the molecular weight of the fragments resulted.
8. Elution of the DNA from the supplied gel and assess the integrity of the fragments.
9. Isolation and purification of RNA from plant/bacterial sample and its quantification using UV spectrophotometer..
10. Isolation and purification of protein from the supplied sample and its quantification using UV spectrophotometer.

PCBT7203 **Micro Biology Lab**

1. Micrometry: calibration of stage and ocular micrometer and measurement of microbial sample.
2. Staining of microbial sample (Gram’s Staining, Capsule staining, Fungal staining)
3. Media preparation and sterilization (Slant, Stab and Broth culture)
4. Isolation of micro organisms from natural habitats (Air, Water, Soil & Milk)
5. Establishment of pure culture by streak plate and serial dilution method.
6. Study the bacterial growth curve using spectrophotometer and viability assessment.
7. Antibiotic assay and estimation of Zone of inhibition.
8. Chemical assay and MIC determination of antibiotics.
9. Biochemical assay of microorganisms (Starch Hydrolysis, Casein Hydrolysis and IMVIC test).
10. Microscopy: Study of Compound, Phase contrast and Fluorescence Microscopes.

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