<table>
<thead>
<tr>
<th>3rd SEMESTER</th>
<th>4th SEMESTER</th>
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<tbody>
<tr>
<td><strong>THEORY</strong></td>
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<td><strong>Code</strong></td>
<td><strong>Subject</strong></td>
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<tr>
<td>BSCM 1205</td>
<td>Mathematics – III</td>
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<tr>
<td>PCME4201</td>
<td>Fluid Mechanics &amp; Hydraulic Machines</td>
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<tr>
<td>PCME4202</td>
<td>Mechanics of Solids</td>
</tr>
<tr>
<td>BECS2212</td>
<td>C++ &amp; Object Oriented Programming</td>
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<tr>
<td>HSSM4201</td>
<td>Engineering Economics &amp; Costing</td>
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<td>OR Organizational Behaviour</td>
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<td>PCMN4201</td>
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<td>Credits (Theory)</td>
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<td><strong>PRACTICALS / SESSIONALS</strong></td>
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<tr>
<td>HSSM7203</td>
<td>Communication &amp; Interpersonal Skills for Corporate Readiness Lab.</td>
</tr>
<tr>
<td>BECS7212</td>
<td>C++ &amp; Object Oriented Programming Lab</td>
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<tr>
<td>PCMN7201</td>
<td>Mine Survey - 1 Lab.</td>
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<tr>
<td>Credits (Practicals/Sessionals)</td>
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<tr>
<td>TOTAL SEMESTER CREDITS</td>
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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:
   Reading Chapters: 11,12(except 12.10),13,14,15
   Reading chapter: 18

Reference books:
   Pearson Education, New Delhi
Module I (13 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 (12 Lectures)
Fluid dynamics: Introduction, Euler’s equation along a streamline, energy equation, Bernoulli’s equation and its application to siphon, venturimeter, orificemeter, pitot tube.


Module III (15 Lectures)
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, Modi & Seth
2. Introduction to Fluid Mechanics and Fluid Machines by S.K. Som and G. Biswas, TMH

Reference Books:
1. Fluid Mechanics by A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics by Fox, 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. First course in Fluid Mechanics by Narasimhan, University press
PCME4202 Mechanics of Solids

MODULE - I (14 Lectures)
1. 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.
2. Members in Biaxial State of Stress: 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.
3. Strain Deformation: Two dimensional state of strain, Mohr’s circle for strain, Principal strains and principal axes of strain measurements, Calculation of principal stresses from principal strains.

MODULE - II (13 Lectures)
4. Shear Force and Bending Moment for Simple Beams:
   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. 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.
6. Deflection of Beams: Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

MODULE - III (12 Lectures)
7. Theory of Columns:
   Eccentric loading of a short strut, Long columns, Euler’s column formula, Lateral buckling, Critical Load, Slenderness ratio
8. 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
3. Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning

REFERENCE BOOKS
7. Strength of Materials by R.Subramaniam, Oxford University Press
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)
5. Mastering C++ - Venugopal, McGraw-Hill Education (India)
HSSM3204 Engineering Economics & Costing

Module-I: (12 hours)


Module-II: (12 hours)


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:


Reference Books:

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:

Module-III:

Text Books:

Reference Books:
1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma” Organizational Behaviour”, TATA Mcgraw-Hill.
Module I

Module II
Compass Surveying – Uses of prismatic compass, temporary adjustment, bearing of a line, local attractions, correction of bearing.
Plane table surveying- Methods of plane table, radiations, intersection, traversing and resection, 2-point and 3-point problem.
Use of Mining type theodolite, Measurement of horizontal and vertical angles.

Module III
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.

Books Recommended:
2) Surveying- Vol.I, by B.C. Purmia
3) Surveying – by Husain & Nagnas.
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.
      iii. Motivating subordinates / juniors (‘pep talk’)
      iv. Instructing/ directing subordinates/ juniors
      v. 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
**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)

**PCMN7201 Mine Survey – 1 Lab**

1. Testing of chain and measurement of correct length of the line.
2. Traversing by chain survey.
3. Traversing by Compass survey.
5. Traversing by plane table.
6. Use of dumpy level and fly levelling.
7. Longitudinal Section and Cross Section of Road.
8. Contouring
10. Traversing by theodolite.
4th Semester

PCME4207 Machine Dynamics (3-0-0)

MODULE – I (12 Hours)
1. Mechanisms : Basic Kinematic concepts and definitions, Mechanism, Link, Kinematic Pair, Classification of kinematic pairs, Degrees 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.

   Acceleration Diagram for a slider – crank mechanism, Corill’s component of acceleration and its application.

MODULE – II (12 Hours)
3. Inertia forces in reciprocating Parts : Velocity and acceleration of piston by analytical method, Angular velocity and angular acceleration of connecting rod by analytical method and by graphical method, Piston effort, force acting along the connecting rod, Crank effort, Turning moment on crank – shaft.
4. Dynamically equivalent system, compound Pendulum, correction couple.
   Turning moment diagrams for different types of engines, Fluctuation of energy and fluctuation of speed.
5. Friction of a screw and nut, Square threaded screw, V-threaded screw, Pivot and collar friction, friction circle, Friction axis, Friction clutches, Transmission of power by single plate, multiplate and cone clutches.

MODULE – III (12 Hours)
   Absorbing and transmission dynamometers, Prony brake, Rope brake, Band brake dynamometer, Belt transmission dynamometer, Torsion dynamometer.
8. Belt, rope and chain drives, Initial tension, Effect of centrifugal tension on power transmission, Maximum power transmission capacity, Belt creep and slip.

TEXT BOOKS
L.A Textbook of Theory of Machines (In S. I. units) – R. K. Bansal, Laxmi Publication
Chapter : 1, 3, 4, 7, 8, 10, 11, 12.

REFERENCE BOOKS :
L. The Theory of Machines – Thomas Bevan.
BEEE7215 Energy Conversion Techniques

MODULE- I (10 Hrs)
1. DC GENERATORS: Constructional features and operating principles, EMF equation, No Load Characteristics for Separately Excited DC Generator and DC Shunt Generator, Conditions for Self Excitation, Critical Resistance and Critical Speed, Losses and Efficiency.

2. 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, Starting, Speed control and application of DC motor.

MODULE- II (10 Hrs)
3. SINGLE PHASE TRANSFORMERS: Constructional Features, EMF Equation, Turns Ratio, Open Circuit Test and Short Circuit Test, Losses and Efficiency, Introduction to Three Phase Transformers: Three Single Phase Transformers Connected as a Bank of Three Phase Transformer.

4. INDUCTION MOTORS: (a) 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.
   (b) Introduction to Single Phase Induction Motors: Construction, Principle of Operation and Application.

MODULE- III (10 Hrs)
5. THREE PHASE SYNCHRONOUS GENERATORS: Constructional Features, Principle of operation as Alternator, Synchronous reactance, Equivalent circuit of alternator, Power-Angle curve, Synchronization of alternators.


Text Book :

Reference Book(s):
2. The Performance and Design of DC Machines – A E Clayton.
3. Theory and Performance of AC Machines – M G Say
8. Electric Machines – Charles Hubert – Pearson Education.
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)
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
Module I  
14 hours
Physical Geology:
Introduction, weathering, erosion, transportation, deposition, Geological action of wind, river, glacier and underground water, Earth quakes and volcanoes.

Structural Geology:
Elementary knowledge of rock deformation, structural characteristics of deformed rocks, attitude of rock beds strike, dip: true and apparent, folds and faults, their description, classification, joints, un-conformities, simple forms of igneous rocks, dykes, sills, batholiths, laccoliths, Iropolithis, phacoliths.

Module II  
16 hours
Mineralogy: Crystals, Axial relationship, symmetry elements and forms of normal classes of cubic Tetragonal, Hexagonal, Orthorhombic, monoclinic and Triclinic, Minerals and their physical properties determinative properties and occurrence of common rock forming minerals, Quartz orthoclase, muscovite, bio tite, Olivine, augite, hornblende, Calcite, dolomite, beryl, tourmaline.

Petrology: General characters of igneous, sedimentary and metamorphic rocks; Description of rocks Viz; granite, diorite, gabbro, dunite, peridofite, peg matite, dolerite, basalt, conglomerate, sand stone, shale, lime stone, quartzite, marble, slate, schist, gneiss, Khondalite and their Indian occurrence.

Module III  
6 hours
Engineering Geology: Geological considerations in connection with-
   a) Dam and associated reservoirs
   b) Tunnels
   c) Bridges
   d) Ground water.

Text Books:
1. Text Book of Geology – P.K.Mukherjee
2. General and Engineering Geology- Parvin Singh
3. Text Book of Geology- G.B. Mahapatra

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
PCMN4203 Mine Development

Module I
Exploratory drilling and blast hole drilling: Different types of exploratory drills and methods of core recovery, different types drills bits used. Different types of drills machines used for blastholes and methods of drilling.

Module II

Module III
Acess to the mineral deposit. Selection, location, size and shape, conventional and special method of shaft sinking, shaft lining. Deepening and widening of shaft. Raising and winzing.

Books recommended:
1) Surface Mining – Dr. G.B.Mishra
2) Blasting Manual – Sandhu & Pradhan
3) EMT volume – 1
4) SME Hand Book

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)
BEEE7215 Energy Conversion Techniques 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 external and internal characteristics of a DC shunt 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. Open circuit and Short circuit test of an alternator.
8. Load test of three phase induction motors.
10. Starting of single phase induction motors

PCMN7202 Geology Lab

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

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