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<th>3rd SEMESTER</th>
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<tr>
<td><strong>THEORY</strong></td>
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<tr>
<td>BSCM1205</td>
<td>Mathematics – III</td>
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<tr>
<td>BSCC1208</td>
<td>Chemistry - II</td>
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<tr>
<td>BECS2212</td>
<td>C++ &amp; Object Oriented Programming</td>
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<tr>
<td>HSSM3204</td>
<td>Engg. Economics &amp; Costing</td>
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<td>OR</td>
<td>HSSM3205</td>
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<tr>
<td>BEME2209</td>
<td>Fluid Mechanics &amp; Machines</td>
</tr>
<tr>
<td>PCEV4201</td>
<td>Principles of Civil Engg.</td>
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**Credits (Theory)** 19

<table>
<thead>
<tr>
<th><strong>PRACTICALS/SESSIONALS</strong></th>
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<tbody>
<tr>
<td>BECS7212 C++ &amp; Object Oriented Programming Lab</td>
</tr>
<tr>
<td>PCME7202 Mechanical Engg. Lab</td>
</tr>
<tr>
<td>PCEV7201 Principles of Civil Engg. Lab</td>
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**Credits (Practicals/Sessionals)** 6

**TOTAL SEMESTER CREDITS** 25

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<td>Database Management System</td>
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<td>Organizational Behaviour</td>
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<td>PCEV4202</td>
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**Credits (Theory)** 19

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<tr>
<td>PCEV7203 Environmental Chemistry Lab</td>
</tr>
<tr>
<td>HSSM7203 COMMUNICATION AND INTERPERSONAL SKILLS FOR CORPORATE READINESS</td>
</tr>
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</table>

**Credits (Practicals/Sessionals)** 6

**TOTAL SEMESTER CREDITS** 25
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:
   Education, New Delhi
Module I


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, Gordon-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, Vijayasarathy, 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
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)
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:
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
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.

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 (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.

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)


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
PCEV4201 Principles of Civil Engineering

MODULE-I:

a. BUILDING MATERIALS: Introduction to building materials:
   Stone, Brick, Timber, Cement, Concrete, Reinforced Cement Concrete (RCC), Glass.
b. BUILDING CONSTRUCTION:
   Introduction to typical building units and components:
   Foundation, Masonry wall (stone & brick), Scaffolding & form work, DPC, Stairs, Lintels, Plaster, Floor, Doors & Windows and Paint.
c. SURVEYING:
   Linear measurements & chain surveying, bearing & compass, plane table, theodolite & traverse surveying, leveling & contouring.

MODULE-II:

MECHANICS OF MATERIALS:

a. Analysis of axially loaded members stress, strain, bars in tension & compression, strain deformation, shear force & bending moment diagrams deflections.
b. RCC Design: Beam, Slab, Column, Footing, Water tanks.

MODULE-III:

Soil Mechanics:
Introduction, Basic terminology, Index properties, Particle size distribution, Permeability, Consolidation, Shear strength, Earth Pressure, Slope stability, bearing capacity, Shallow foundation.

Text Books
1. Building material- Rangwalla, S.c.
2. Building construction - Rangwalla, S.c.
3. Surveying Vol-1- B.C. Punmia
5. Soil Mechanics- B.C. Punmia

Reference Books
1. Surveying – P.B.Sahani
3. Soil Mechanics – VNS Murthy
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)

PCME7202  Mechanical Engg. Lab

Group A
1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Inertia of Flywheel

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.

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.
1. Exposures to Building Components, such as Foundation, DPC, Wall, Beam, Roof, Cornice, Parapet.
2. Finding area of a polygonal land, using Chain and Prismatic Compass.
3. Finding out Reduced levels of various spots of a grid layout using Dumpy level.
4. Finding out Reduced levels of various spots of a grid layout using Theodolite.
5. Exposure in handling of a total station.
6. Exposure in handling of Global Positioning System (GPS)
7. Finding of Plastic Index (PI) value of a given soil sample.
8. Finding of specific size & uniformity Co-efficient of a bulk sand sample required for filter media.
9. Finding out the Concrete cube strength through Universal Testing Machines.
10. Finding out tensile strength of a reinforce steel sample.

Books

1. Surveying Vol-1- B.C. Punmia
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:**

   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)

   Reading Chapters: 22, 23( except 23.5 and 23.8)

**Reference books:**

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 lattice, 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.
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
Module I:  
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:  
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: 
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
UNIT 1
Classification of industries: (a) small, medium, large (b) organic, Inorganic (c) highly polluting, moderately polluting, non polluting. Process Flow Sheets: Significance, symbols, informations, block flow diagram, flow diagram.
Materials of construction: Steel, Alloys, Refractory, Coating, Plastics, Glass lining, FRP, Electrochemicals: Alkalies, Electroplating, Electrorefining
Process conditions: Effect of temperature, pressure, concentration, flow rate, catalysts etc.

UNIT 2
Material balance: Conservation of mass, Chemical stoichiometry, mass transfer through phase change, material balance across unit; Overall material balance.

UNIT 3
Study of heavy chemicals: Chlorine, HCl, Soda Ash, Sulfuric Acid, Phosphoric Acid.
Fertilizers and its types (N, P, K):
1) Nitrogenous fertilizers
2) Phosphatic fertilizers
3) K fertilizers
Brief overview about the management of industrial solid, liquid and gaseous wastes

Textbooks
1. Outlines of Chemical Technology- C.E.Dryden.
2. Chemical process principles part-1:- Houghen, O; Watson KIM and Ragatz, R.A

Reference Books
1. A textbook of Chemical technology- S.d.Shukla and G.N. Pandey
2. Chemical process industries- R.N.Shreve.
3. Publication of Fertilizer Association of India, New Delhi
4. Industrial Chemistry- Faith, Keyes and Clark
5. Handbook of Industrial chemistry- Riegel
PCEV4203 Environmental Chemistry

UNIT 1
Atmospheric chemistry:
(a) Basic components: Pollutants, contaminants, receptors, sink, pathways of pollutants.
(b) Major regions of atmosphere, particles, ions and radicals in atmosphere, Thermochemical and photochemical reaction in atmosphere, smog, NOx, SO, hydrocarbons, suspended particulate matter, chemistry of action of pollutant and effects.

UNIT 2
Aquatic chemistry:
(a) Aquatic environment, water pollutants, colloidal dispersion in water, traces elements in water.
(b) Water quality parameters, pH, conductance, dissolved oxygen, B.O.D and C.O.D of waste water.
(c) Sanitary significance of sulphate, phosphate, nitrate fluoride and cyanide and their effects.

UNIT 3
Soil chemistry-Inorganic and organic components of soil, nitrogen pathway in soil, Fertilizers. Toxic chemicals in the environment: pesticides, arsenic, cadmium, lead, mercury, carbon monoxide, PAN, MIC, Radioactive wastes Microbial metabolism of heavy metals, pesticides etc.

TEXT BOOKS:
2. Environmental Chemistry – A.K. Dey, Willy Eastern

REFERENCE BOOKS:
2. Aquatic Chemistry – Stumm and Morgan
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)

PCEV7203  **Environmental Chemistry Lab**

*Analysis of water and wastewater samples*

1. Colour and turbidity.
2. Determination of solids
3. Alkalinity, acidity $P_H$.
4. Determination of chloride and conductivity.
5. Estimation of iron.
8. Determination of sulphate and phosphate.
10. Determination of Ammonia, Nitrite, Nitrate and total kjeldahl nitrogen.

**BOOKS:**

2. Examination of water and waste water manual.
3. Manual on water and waste water analysis - NEERI.
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.
      iii. Motivating subordinates / juniors (‘pep talk’)
      iv. Instructing/ directing subordinates/juniors
      v. Expressing / recording appreciation, praising / rewarding a subordinate or junior
      vi. 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
## BIJU PATNIK UNIVERSITY OF TECHNOLOGY, ORISSA

### Environmental Engineering

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<tr>
<td>HSSM3301</td>
<td>Principles of Management OR Optimization in Engineering</td>
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<tr>
<td>PCEV4302</td>
<td>Environmental Biology &amp; Ecology</td>
<td>3-1-0</td>
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<td>PCEV4301</td>
<td>Environmental Microbiology &amp; Toxicology</td>
<td>3-1-0</td>
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<tr>
<td>PCEV4303</td>
<td>Water Supply &amp; Waste Water Collection Systems</td>
<td>3-0-0</td>
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<tr>
<td>PCEV4304</td>
<td>Water Resources Engineering</td>
<td>3-1-0</td>
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**Free Elective-I (Any one)**
- PCEV7301 Energy Conservation & Environment
- FEEV6301 Energy Conservation & Environment
- FEEV6302 Public Health and Sanitation.

**Free Elective-II (Any one)**
- FEEV6303 1) Recycle and Reuse Technology
- FEEV6304 2) Statistical Methods for Environmental Analysis

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<td>HSSM3302</td>
<td>Optimization in Engineering OR Principles of Management</td>
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<tr>
<td>PCEV4305</td>
<td>Water &amp; Waste Water Engineering-I</td>
<td>3-1-0</td>
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<tr>
<td>PCEV4306</td>
<td>Fundamentals of Air Pollution</td>
<td>3-0-0</td>
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<td>PCEV4307</td>
<td>Solid &amp; Biomedical Waste Management</td>
<td>3-1-0</td>
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<tr>
<td>PCEV4308</td>
<td>Environmental Impact Assessment</td>
<td>3-0-0</td>
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**Practical/Sessional**
- PCEV7301 Environmental Monitoring Lab-II Microbiology & Toxicology 0-0-3 2
- PCEV7302 Environmental Monitoring Lab-III Environmental Chemistry 0-0-3 2
- PCEV7303 Environmental Monitoring Lab-IV Air Monitoring Lab 0-0-3 2
- PCEV7304 Design & Drawing of Environmental System Lab 0-0-3 2

**TOTAL SEMESTER CREDITS** 25

**TOTAL CUMULATIVE CREDITS**
Module I: Functions of Management
Concept of Management, Management as an Art or Science, The Process of Management, Managerial Skills, Good Managers are Born, not Made, Management is concerned with Ideas, Things and People, How a Manager Induces Workers to Put in Their Best, Levels and Types of Management, Evolution of Management Thought: Managerial Environment, The process of Management-Planning, Organizing, Directing, Staffing, Controlling.

Module II: Marketing Function of Management.


Reference Books:
2. Business Organization & Management, Tulsia, Pandey, Pearson
3. Marketing Management, Kotler, Keller, Koshi, Jha, Pearson
4. Financial Management, I.M. Pandey, Vikas
5. Human Resource Management, Aswasthapa, TMH.
HSSM3302 OPTIMIZATION IN ENGINEERING (3-0-0)

Module-I (10 Hours)
Idea of Engineering optimization problems, Classification of optimization algorithms, Modeling of problems and principle of modeling.
Linear programming: Formulation of LPP, Graphical solution, Simplex method, Big-M method, Revised simplex method, Duality theory and its application, Dual simplex method, Sensitivity analysis in linear programming

Module -II (10 Hours)
Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel’s approximation method, Degeneracy, Optimality test, MODI method, Stepping stone method
Assignment problems: Hungarian method for solution of Assignment problems
Integer Programming: Branch and Bound algorithm for solution of integer Programming Problems
Queuing models: General characteristics, Markovian queuing model, M/M/1 model, Limited queue capacity, Multiple server, Finite sources, Queue discipline.

Module -III (10 Hours)
Non-linear programming: Introduction to non-linear programming.
Unconstraint optimization: Fibonacci and Golden Section Search method.
Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method
Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming
Introduction to Genetic Algorithm.

Recommended text books

Recommended Reference books:
MODULE-I

MODULE-II

MODULE-III
Effects of different types or pollution on aquatic biota, Effect of eutrophication. Concept of stress & strain. Definition and function of Biomonitoring. Biotechnology- Fermentation, Vermiculture and Biofertilizer technology.

Text Books:

Reference Books :
PCEV4301 ENVIRONMENTAL MICROBIOLOGY AND TOXICOLOGY (3-1-0)

MODULE-I

MODULE-II

MODULE-III

Toxicity of metals like mercury, cadmium, arsenic lead, fluorides, toxicity of pesticides, Bio magnification, Antidotes and neutralization of toxicity.

TEXT BOOKS
1. Microbiology – P.D.Sharma – Rastogi publication
2. Concept of Toxicology – Omkar – Shoban Lal Nagin Chand & Co.

Reference Books

Lehninger Principles of Bio-Chemistry- Nelson & cox
PCEV4303 WATER SUPPLY AND WASTE WATER COLLECTION SYSTEM (3-0-0)

MODULE-I
(Raw water collection and Treated water distribution System)
Introduction and overview of urban and rural water supply system:- Sources selection, Population estimation, Design period, Domestic institution, commercial and industrial needs.
Preliminary Hydraulic design of pressure conduits system (Dead end method and loop network method. Water hammer, it’s check in pipes and it’s control devices.
Introduction to special and fitting in pipe lines, some examples of different types of valves, elbow, union etc.

MODULE –II(Waste water collection systems)
Types of surface and underground drainage system, their merits and demerits.
Types of sewerage- lateral, sub main , Main intercepting and outfall sewers.
Hydraulic design of gravity sewerage system – Sources, rate of domestic sullage and waste water flow, infiltration, exfiltration, pick factor, pressure sewers.
Appurtenances – Manhole, Street inlet, Inverted siphon, House drainage connection, Sewer junction and transition. Waste water pumping - types of pumps.

MODULE –III (Storm water collection systems)
Overview of external storm water collection system – estimation of runoff and design of drains and sewers system. Hydraulic design of gravity storm drainage system. Open drains – Types of drains (Primary, Secondary and Tertiary)
Disposal of sullage water in rural area – septic tanks soak pits. Disposal in natural valley, agricultural and low lying area.

Text Books:-

Reference Books:-
1. Design of waste water treatment systems - Quasim.
PCEV4304 WATER RESOURCES ENGINEERING (3-1-0).

**MODULE-I**
Water resources:- Water Wealth of India, River basins and their potential. Importance of water resources projects in the country. Rain water harvesting, Ground water recharge, Hydrologic cycle, concept of catchments and water budget equation.

Precipitation- Types, measurement, non-recording and recording type of rain gauge. computation of depth of precipitation over an area, Mass curve and consistency of rainfall data.

**MODULE-II**

Stream gauging - Measurement of stage and velocity, Area- Velocity method, slope – area method, simple, Stage - discharge curve.

**MODULE-III**
Hydrograph theory - Components of hydrograph,
Separation of base flow, Module hydrograph theory.
Application of Module hydrograph.
Ground water hydrology-scope and importance. Occurrence of ground water. definitions:-aquifers, aquitard, aquifuge, aquiclude, perched aquifer, aquifer parameters . Darey’s law and its validity, steady radial flow into a well in confined and unconfined aquifers, pumping test and recuperation test.

**Text Books:**

**Reference Books:**
Free Elective

FEEV6301 ENERGY CONSERVATION AND ENVIRONMENT (3-0-0)

MODULE-I
Introduction to Energy Sources: Indian Energy Scenario: Energy Consumption, needs and crisis, energy sources and availability.
Renewable Sources of Energy and Environment: Biomass- introduction energy plantation, biomass conversion technologies (wet and dry process) photosynthesis, agricultural waste derived energy, urban waste derived energy.

MODULE-II
Non-renewable Energy Sources and Environment: Coal, natural gas-site selection for thermal power plants, fuels for thermal power plants, ash handling systems (brief) Associated Environmental Effects.
Oil : Diesel and electric power plants, essential compounds of diesel – electric plants (types); natural gas - classification and comparison of different gas turbine power plants, Associated Environmental Effects.
Nuclear Energy: Why nuclear power for developing countries, general components of nuclear reactions, different types of reactors, breeding reactors, location of nuclear power plants, disposal of nuclear wastes, Associated Environmental Effects.

MODULE-III
Alternative sources of renewable energy
Energy form Oceans: ITEC (Ocean Thermal Electric Conversion), methods of ocean thermal electric power generation, site selection. Energy from tides-basic principles of tidal power, components of tidal power plant.

Text Book:

Reference Book:
Module-I
Water sanitation:- Sanitary consideration for location and construction of walls. Water impurities and biological contamination of water, Water pollution and health, water purification, Drinking water Standards & their significance.

Module-II
Refuse sanitation :- Refuse collection & disposal, quantitative & qualitative characteristics of garbage.

Food sanitation:- Food and Drug act, Food poisoning Balance diet. Food storage and preservation principles of milk sanitation.

Module-III
Industrial hygiene:- Elementary Physiological hygiene, Factors affecting health, Comfort Productivity, Occupational health hazards in industry.

Book:-
1. Introduction-Lab layout, lab apparatus washing, sterilization, sampling procedure collection,- Transportation and handling preparation of culture media.
2. Bacteriological examination of recreational water.
3. Plate count, multiple tube fermentation Techniques (3 and 5 tubes) 0 and membrane filter technique for coliform.
5. Bacterial cell immobilization and mixed culture tests.
6. Identification of plankton and fungi.
7. Bioassay tests for aquatic organisms demonstration.
8. Fluoride from ground water
9. Pb, Cd, Hg and Cr from waste water samples.
10. Preparation of $LC_{50}$, $LC_{100}$, $LD_{50}$ and $LD_{100}$.

BOOKS
1. Standard methods for the examination of water and waste water--AWWA, APHA.

PCEV7302 ENVIRONMENTAL MONITORING LABORATORY-III.

(ENVIRONMENTAL CHEMISTRY ) - (0-0-3)

1. Introduction process laboratory equipment and their applications.
2. Determination of Dissolved oxygen.
3. Chlorine demand in water
5. Residual chlorine in water.
6. Filtration - Single media and Dual media.
7. Biochemical Oxygen Demand (BOD) from recreational and waste water.
8. Experimental studies on Flocculation and sedimentation process.
   (Jar Test, Column- Test, Pebble Bed Flocculator)
9. Grain size analysis Effective size, uniformity coefficient.
10. Determination of Chemical Oxygen Demand (COD) from waste water.
11. Productivity measurement of any water body.

BOOKS
1) Standard methods for examination of water - APHA, AWWA, WPCF- Washington DC.
2) Chemistry for environmental engineers- Sawyer - McCarty - McGraw Hill.
PCEV4305 WATER AND WASTE WATER ENGINEERING-I (3-1-0)

MODULE-I (Surface Water Treatment System)
Quality of raw water (turbidity, Suspended solid, odors, colours, organic matters)
Aeration, Flocculation, Coagulation, Sedimentation, Filtration – Slow sand filter,
Gravity and pressure filters, Disinfection – common disinfectants, types of chlorination – Breakpoint chlorination, chlorine demand and safety measures.

MODULE-II (Waste Water Treatment System)
Pretreatment (Screening and Grit removal), Bar Screens, Sedimentation, Suspended and fixed growth systems, Aerobic and Anaerobic system, Activated sludge process, Trickling filters, biological contactors, Biofilters, Secondary sedimentation tanks, Stabilization ponds – Aerobic, facultative, Anaerobic lagoons

MODULE-III
Characterization of sludge - Quantity, Quality and volume, sludge mass balance, Sludge pumping, Thickening, Stabilization, Dewatering, Sludge Drying beds, Disposal of wastes

Text Books:

Reference Books
2. Design of waste water treatment systems - Quasim.
3. A text book of water supply and waste water engineering - Hammer etal
MODULE - I
Air Pollution: atmospheric structure and composition, scales of air pollution problems—local, urban, regional, continental and global.
Natural and anthropogenic pollutants, emission inventory source classification, primary and secondary pollutants, properties of major air pollutants along with sources and sinks, particulates and gases. Modules of measurements of air pollutant. Simple problems on Module conversion. Photochemical air pollutants, Air pollution due to automobiles. Smoke and its measurement.
Air pollutants effects on human health and welfare, vegetation, animals, materials and structure, Acid rain, Green house effect, Ozone depletion and Heat island effect.

MODULE - II
MEASUREMENT OF AIR POLLUTANTS.
Measurement of gaseous (CO, HC, NO\(_x\), SO\(_2\)) and particulate pollutants, sampling devices, sampling train, sampling methods/techniques, stack sampling techniques. Ambient Air quality standard (CPCB). Air pollution indices- determination of pollution index by different methods.

MODULE - III
ATMOSPHERIC DISPERSION OF STACK EFFLUENTS: Plume rise, effective stack height, guide lines for fixing stack height, problems on plume rise' calculations. Gaussian plume model- for point source. Gaussian dispersion coefficients, Pasquil - Gifford atmospheric stability classification.
Meteorology: Meteorological factors- heat, solar radiation, temperature, lapse rate, wind, humidity, precipitation, mixing height, pressure, atmospheric stability conditions, wind velocity profile, wind-rose diagram. Inversion- types, plume behavior under different atmospheric stability, effect of topography on pollutant dispersion.
Down ground-level concentration computation, maximum ground level concentration. Instantaneous puff. Dispersion model. Estimate for various sampling times and decay of pollutant.

NOISE POLLUTION: Sources of noise, effects of noise pollution, Modules & measurement or noise, control of noise pollution, standards. Equations & Application.

Text Books:-

Reference Books:-
3. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero- PHI Pub
MODULE-I
INTRODUCTION: Definition, Sources, Composition and Properties of Municipal Solid Waste. Generation, Collection rates, waste handling and separation, storage and processing at the source.
COLLECTION TRANSFER AND TRANSPORTATION: Types of equipments, personnel requirements, analysis & collection system, collection routes, types of transfer stations, transport means and methods, location and transfer stations.

MODULE-II
DISPOSAL: Landfill, Classifications, Types, Sitting Considerations, Generation, movement and control of gases and leachates, layout and preliminary design of landfills.
Processing of Solid Waste
Aerobic, Anaerobic digestion, Composting, Incineration and energy Production.

MODULE-III
Biomedical waste management :- Sources, Hazadous associated with bio-medical wastes, Biosafety, Storage of biomedical wastes, disposal and processing.

TEXT BOOKS :-

Reference Books:-
3. CPHEEO Manual on Solid Waste Management.
4. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero- PHI Pub
MODULE-I
Introduction to environmental impact analysis. EIA under NEPA (National Environmental Policy Act), Methodologies screening and scooping criteria, Rapid and comprehensive EIA, Environmental health impact assessment. Environmental risk analysis.

MODULE-II
Applications of EIA - Base line collection data, prediction and assessment of impacts of physical, Biological and socioeconomic environment, Generation of environment management plan, post project monitoring. EIA report and EIS review process. Methodologies and evaluation techniques of EIA, their selection for specific projects. Impact identification, Impact prediction, Evaluation and mitigation, monitoring and auditing in EIA process.

MODULE-III
Public participation in decision making. Rehabilitation of degraded landscape, Water bodies, mangroves. Sustainable development concept and strategies, cost benefit analysis, Environmental priorities in India and sustainable development. Case studies of reservoir and irrigation projects, ports, mining areas, coastal and industrial zones.

Text Books:-
1. Environmental Impact assessment - Y. Anjaneyulu etal

Reference Books:-
1. Environmental impact analysis - R.K. Jain etal
2. Environmental Engineering by G. Kiely McGraw Hill
Free Elective

FEEV6303 RECYCLE AND REUSE TECHNOLOGY (3-0-0)

MODULE-I
Waste as a resource - Disposable materials, recycling, collection processing, potential for Reuse.

MODULE-II
Recycling System
Design of recycling systems, collection system, process Train design, and complexity, product design of Recycling, conveyance, Transport safety. Efficiency of operation systems.

Water reuse - Direct and indirect reuse, Ground water recharge, examples of water Reuse, Close. cycle and open cycle Reuse, Recreational Reuse.

MODULE-III
Metal recovery-- Ferrous metals- Non-ferrous metal separation,
Reuse of industrial effluent - urban effluent reuse in Arid and semi-Arid zones. uses of sewage in pisci culture, Ground water recharge of sewage effluent.

Text Books:-
FEEV6304 Statistical Methods for Environmental Analysis
(3-0-0)

Module-I
Data analysis, Sample and Sampling design, Dispersion of data and measurement of dispersion and central tendency in data (mean, median & mode), Natural, binominal and Poisson distributions.

Module-II
Test of hypothesis, Type-I & Type-II errors, Significance of data t-test & Chi-square test.

Module-III
Association analysis, Correlation and Linear regression analysis, Analysis of variance one and two factor design.

Text Books:-
1. Biostatics by Mishra & Mishra
2. Statistical Methods by S. C. Gupta
1. Introduction to atmospheric monitoring - particulate sampling - Dust Fall. Pollution suspended particulates and total particulate matters using H.A.S.

2. Estimating sulphur dioxide in Ambient air using High volume air sampler.


4. Stack sampling Techniques and Demonstration of stack monitoring.

5. Exercises on Ambient gas monitoring using GASTEC DEVICE Demonstration/ Exercises on Air pollution control Devices - Bag filter, Scrubber, Cyclone and ESP.


7. Exercises on smoke density meter for Diesel engines.

8. Exercises on Noise measuring instrument.

9. Exercises on luxmeter (light measuring instrument.)

11. Humidity measurement

**Books** :-

2. Air pollution theory and control- Stern.
DESIGN AND DRAWING OF ENVIRONMENTAL SYSTEMS (0-0-3)

1. Introduction- Preparation of layout of water supply system for a two storey building.

2. Design and Drawing of canal/River and Reservoir intake.

3. Drawing of bore well / Infiltration well for Rural areas.


5. Design and drawing of flocculation and sedimentation Modules (plan and sectional elevation)

6. Design and Drawing of Rapid and Filters (plan and Section)


8. Design and drawing of Defluoridation and softening Modules.

Books:-

1. AWWA, Water Quality treatment, McGraw Hill.


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## BIJU PATNIK UNIVERSITY OF TECHNOLOGY, ORISSA
### Environmental Engineering

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<th>7th SEMESTER</th>
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**Credits (Theory)**: 16

**PRACTICALS/SESSIONALS**

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**Credits (Practicals / Sessionals)**: 7

**TOTAL SEMESTER CREDITS**: 23

**PRACTICALS/SESSIONALS**

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**Credits (Practicals / Sessionals)**: 10

**TOTAL SEMESTER CREDITS**: 26

**TOTAL CUMULATIVE CREDITS**: 183

**TOTAL CUMULATIVE CREDITS**: 204
WATER AND WASTE WATER ENGG-II (3-0-0)

MODULE-I
Removal of Refractory organics – Adsorption isotherm, Operation and design procedure for activated carbon adsorption column.
Immobilized cells in waste water treatment, Enzymes and microbial cell immobilization, whole-cell immobilization, Immobilized cell reactors.

MODULE-II
Hydraulic design of septic tanks, up-flow anaerobic sludge. Blanket reactor (VASB), up-flow packed bed attached growth reactor. Anaerobic sludge digestion, digestion and stabilization, Gas generation, removal of dissolved inorganic substances – chemical precipitation, Nutrient removal, Iron exchange method, Reverse osmosis, Electro dialysis, membrane filtration

MODULE:I--III
Treated waste water disposal on land and it’s osmotic effects and toxic effects, Tertiary treatment of wastewater ------- disinfection, Reuse of treated waste water as cooling water, Process water in industrial and agricultural sludge disposal.

TEXT BOOKS:

Reference Books :-
1. Environmental Engineering By Howard S. Peavy, Donald R. Rowe & George Tehobanoglous.
2. Sewage Disposal and Air Pollution Engineering S.K. Gerg.
3. Environmental Engineering – Gerard kiely
INSTRUMENTAL METHODS FOR ENVIRONMENTAL MONITORING (3-0-0)

MODULE-I

Potentiometric titrations, Ion-selective electrodes Electrophoresis, Principle and techniques of adsorption chromatography, paper chromatography and High performance liquid chromatography.

MODULE-II

Basic principles and applications U.V- visible and I.R. spectroscopy.

MODULE-III

Basic principles and applications of atomic absorption spectroscopy (AAS) and Atomic Emission spectroscopy (AES). Flame photometry.

Text Books:-

1. Instrumental methods of Analysis – Merrit and Dean et. al – Van No Strand

Reference Books :-

2. Analytical Chemistry, Theory & Practice by U.N Das, Sultan Chand & Sons, New Delhi
4. Instrumental methods of chemical analysis – B.K. Sharma
BIOLOGICAL TREATMENT PROCESSES (3-0-0)

MODULE-I

MODULE-II
Aerobic and anaerobic suspended and attached growth systems, Activated sludge treatment process and hydraulic design, Reactor configuration, Process analysis, design and control.

MODULE-III
Trickling filter, Rotating Biological Contactor (RBC), Fluidized Aerobic Bioreactor (FAB), Fluidized Bed Bio-reactor (FBBR), Restoration of degraded land, Biogas from wastes, Batch and continuous stirred tank reactors.

TEXT BOOKS :-

Reference Books :-

AIR AND WATER POLLUTION CONTROL ENGINEERING (3-1-0)

MODULE-I

MODULE-II
Effluent standards, physical, chemical and biological water quality parameters. Industrial waste water- treatability studies – segregation. Control of pollutants Coagulation, sedimentation, thickening, precipitation, biological oxidation, bio-methanation, adsorption, ion-exchange membrane separation, Chemical oxidation, sludge disposal method.

MODULE-III
Control of water pollution from distillery, pulp and paper, textile, fertilizer, tanneries, food and pesticide industries.

Text Books:

Reference Books :
3. Environmental Engineering – Gerard kiely
ENVIRONMENTAL SYSTEM MODELING (3-1-0)

Module -1
Definition, Classification, examples and models of environmental systems, Purpose of modeling, Problem in modeling.

Module – II
Introduction to air quality models, Air pollution meteorology, Atmospheric turbulence, Gaussian Plume model and modifications. Simulation of special meteorological and topographic conditions. Air Pollution control models.

Module – III
Water quality and water resource management models. Dissolved oxygen and temperature in rivers solid waste generation models.

TEXT BOOKS :

Reference Books :
2. Environmental Pollution – S.M. Khopkar
MODULE-I
Occupational Safety and Health Act, Occupational Safety and Health Administration, Right to know Laws

**Accident Causation**: Cause of Accidents, Deaths in Work Accidents, work injuries. type of accidents, chemical and heat burn injuries.

**Theories of Accident Causation**: Domino, Human Factor, Petersew's Accident Incident, Epidemiological, Human Error Model.

MODULE-II

**Ergonomics**: Definition, factors associated with physical stress, worksite analysis programme, hazard prevention and control. Specific ergonomic problems and problem solving strategies, economics of ergonomics.


MODULE-III


REFERENCES:

3. Anand Gopal Mukherjee, Environmental Pollution and Health Hazards :Causes and Control, Galgobio Publications Pvt. Ltd.
ENVIRONMENTAL SYSTEM OPTIMIZATION (3-0-0)

MODULE-I
Formulation and Analysis of environmental systems, Mathematical modeling and optimization. Optimization and Algorithms.

Methods of Lagrange multipliers, unconstrained and constrained optimization, sequential search Algorithms, Box's Algorithms.

MODULE-II
Linear programming models- Simplex method, Separable and integer programming, Transportation models, Dynamic Programming models, Assignment problems.

MODULE-III
Applications to waste water management systems, water supply and waste water collection system, Agricultural non-point source pollution problem, air pollution control and management systems, solid waste collection.

Books:-

MODULE-I (12 Lectures)


(Book-1:- Chap-1: 1.1 to 1.3, Chap-2: 2.1 to 2.4, Chap-3: 3.2 to 3.4 & Chap-4: 4.2 to 4.5)

MODULE-II (14 Lectures)

Neural Networks: Neuron Abstraction, Neuron Signal Functions, Mathematical Preliminaries, Neural Networks Defined, Architectures: Feed forward and Feedback, Salient Properties and Application Domains of Neural Networks, Multi-layered Network Architectures, Back-propagation Learning Algorithm, Practical Considerations in Implementing the BP Algorithm, Structure Growing Algorithms, Universal Function Approximation and Neural Networks, Applications of Feed Forward Neural Networks, Reinforcement Learning, Radial Basis Function Networks, Regularization Theory Route to RBFNs, Generalized Radial Basis Function Network, Learning in RBFNs, Associative Learning, Hopfield Network, Content Addressable Memory, Bidirectional Associative Memory, Self Organizing Feature Maps, Applications of the Self Organizing Map.

(Book-2:- Chap-3: 3.1 to 3.6, Chap-6: 6.1 to 6.2, 6.5 to 6.6 & 6.8 to 6.10, Chap-8: 8.4 to 8.7,
Chap-10: 10.2 & 10.5 to 10.6 & 10.16 and Chap-12: 12.8 to 12.9)

MODULE-III (08 Lectures)


(Book-1:- Chap-5: 5.1, 5.3 to 5.5, Chap-7: 7.2 to 7.5 and Chap-12: 12.2 to 12.3)

TEXT BOOK:

2. "Neural Networks: A Classroom Approach" By Satish Kumar, TMH Education

Reference Book:

ENVIRONMENTAL GEOSCIENCE (3-0-0)

MODULE-I

Chemical composition. Mineral resources- Properties, and uses of some important minerals. New areas of exploration of mineral resources. Environmental impact of exploitation, processing and smelting of minerals.

MODULE-II
Water resources:- Hydrological cycle, water bearing properties of rocks and soils, methods of ground water exploration with respect to civil engineering, global water balance, Effects of withdrawal of ground water, recharge of groundwater.

MODULE-III
Natural Hazards –Earthquake-causes and effects, Measurement of intensity and location of Epicenter. Floods, cyclones. Landslides-causes and control Metrology.

BOOKS
1. Engineering Geology - B.S. Sathyanarayana Swamy.
4. Engineering and General Geology - Parbin Singh.

NATURAL RESOURCES AND MANAGEMENT (3-0-0)

Module-I
Concept of natural resources, Renewable and Non-renewable resources, Coal, Bauxite, Iron ore and manganese resources of India in general and Odisha in particular.

Module-II
Forest resources:- Biodiversity resources like fishery resources, forest & wild life resources, management of wild life, Mangrove plantations, Environmental effects of deforestation, Land resources – Classification of land resources. Range land & its management.

Module-III
Fuel Resources:- Coal petroleum, Natural gas, Solar energy resources, Hydrogen as future fuel, Energy from biomass – Biomass as fuel, Biogas plant & generation. Use of biogas.

Test Books: -
BIOMEDICAL INSTRUMENTATION

Module – I (10 Hours)
**Fundamentals of Biomedical Instrumentation:** Sources of Biomedical Signals, Basic Medical Instrumentation System, Intelligent Medical Instrumentation Systems, PC Based Medical Instrumentation Systems, General Constraints & Regulations of Medical Devices

**Biomedical Signals & Electrodes:** Origin of Bioelectric Signals-Repolarization, Depolarization, Resting Potential Recording Electrodes – Ag-AgCl Electrodes, Electrodes for ECG, EEG, EMG, Microelectrodes, Skin Contact Impedance, Motion Artifacts

Module – II (13 Hours)
**Physiological Transducers:** Introduction to Physiological Transducers, Classification of Transducers, Pressure Transducers, Transducers for Body Temperature Measurement, Biosensors, Smart Sensors

**Biomedical Recording Systems:** Basic Recording Systems, General Considerations for Signal Conditioners, Biomedical Signal Analysis Techniques, Signal Processing Techniques, Writing Systems: Direct Writing Recorders, Inkjet Recorder, Potentiometric Recorders, Digital Recorders

**Biomedical Recorders:** Electrocardiograph (ECG), Phonocardiograph, Electroencephalograph (EEG), Electromyograph (EMG)

Module – III (14 Hours)
**Patient Monitoring Systems:** System Concepts, Measurement of Heart Rate, Blood Pressure Measurement, Measurement of Respiration Rate


**Patient Safety:** Electric Shock Hazards, Leakage Currents, Safety Codes for Biomedical Equipment

**Text Books:**

**Reference Books:**
ENVIRONMENTAL MONITORING LAB-V
(Instrumentation Lab) (0-0-3)

1. PH measurement - water, waste water and soil.
2. Conductance measurement.
4. Chromatographic experiments:-
   Paper chromatography, Thin layer chromatography and column chromatography.
5. Electrophoresis.
7. Fluorimetry and Phosphometry.
8. Centrifugal Analysis
9. Flame Photometry Analysis
10. Nephelometric Analysis

BOOKS

2. Instrumental methods of analysis - Merritt and Dean etal - Van No strand.
MARKETING MANAGEMENT (3-0-0)

Objective of the Course: The course aims at introducing the basic concepts of marketing to the undergraduate students in engineering. The learning shall help the students in better designing, manufacturing and selling product/service packages keeping competitive market, customers and cost in view.

Module – I (10 hours)
Marketing Management: Concept, Process, Functions and relevance in the current context.
Marketing Environment: Elements of micro and macro environment
Competition Analysis: Factors contributing to competition, porter’s five forces model, Identifying and analyzing competitors.
Market Research and Information Systems: Research Process, The Internet and World Wide Web based Information collection and processing, Database, Data Warehouses and Data Mining, Global Market Research.
Consumer Behavior: Factors influencing consumer behavior, consumer decision process. Organizational buying behavior.

Module II (10 hours)
Market Demand Forecasting: Key Terms, Forecasting Tools: Short term tools: Moving average and Exponential smoothing methods, Long-term forecasting Tools: Time series analysis, Econometrics methods, Qualitative tools: Buying Intention Survey, Sales Force Opinion and Delphi Techniques.

Module – III (10 hours)
Pricing Decision: Objectives and Factors influencing pricing, Pricing method and strategies.
Integrated Marketing Communication(IMC)- Concept of IMC, the marketing communication process, Promotion Mix, elements of promotion mix, Direct marketing.
Channels of Distributions: Types of intermediaries, functions of distribution channels, channel levels, Designing Distribution Channels, Physical Distribution, Supply Chain Management (Basic only).
Trends in Marketing: Green Marketing, Customer Relationship Management, E-marketing, Rural Marketing and Service Marketing (concepts only)

Books:
Text Book:
1. Etzel , Walker , Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.

Reference
HAZARDOUS WASTE MANAGEMENT (3-1-0)

MODULE-I


MODULE-II

Environmental legislation – Characterization and treatment, Chemical, physical and biological treatment, thermal processes, transportation, storage, ground water contamination.

MODULE-III

Disposal techniques - Open dumping, land filling, incineration, composting, potential methods of disposal- utilization, recovery and recycling. Injection well disposal, process selection and facility sitting, Site remediation- Feasibility studies and management issues.

Text Books:


Reference Books:

MODULE –I
Introduction : Sources of Industrial Wastewaters. Industrial Wastewater Survey.
Variation in Quantity and Quality of Industrial Wastewater: Monitoring, Estimation of average characteristics and Loading with problems.
Toxicity of Industrial Wastewaters to Aquatic Biota: Testing Methods and Modules, Biomonitoring of Effluents.

MODULE –II
Joint Treatment: Raw Industrial Wastes and Domestic Sewage after Mixing Partly or fully. Selection of Treatment Method.
Approaches to Minimization of Industrial Wastewater: Problem by Volume Reduction, Strength Reduction, Equalization, Neutralization and Proportioning. Design Examples.

MODULE –III

TEXT BOOKS:–
Reference Books:–
Module 1  
18 Hours

Introduction: Functional Units, Classification, Performance characteristics, Dynamic Calibration, Errors: An Overview, Statistical Error Analysis, Reliability and Related Topics (Chapter 1 of Text Book)

Instruments for Analysis: Introduction, Gas Analysers, Liquid Analysers, X-ray Methods, Chromatography (Chapter 8 of Text Book)

Module II:  
10 Hours


Module III:  
10 Hours


Hazard and Safety: Initial consideration, Enclosures, Intrinsic Safety, Prevention of Ignition, Methods of Production, Analysis Evaluation and Construction (Chapter 13 of Text Book)

Text Book:

Reference Books:
1. Process/Industrial Instruments and Controls Handbook, Gregory K. Mc Millian Editor-in-Chief, Douglas M. Considine Late Editor-in-Chief
MODULE-I
Water Act, 1974 - Preliminaries and Definitions, constitution of pollution boards, powers and functions of board, prevention and control of water pollution. Power of state Govt. Power to obtain information and take samples or effluents, restriction on new outlets and discharges, refusal or withdrawal or consent by state board, Power to give directions, penalties and procedure.

MODULE-II
Air Act, 1981 and E. P Act, 1986 - Preliminaries, and definitions, Powers and functions of the board, Power to declare air pollution control areas, penalties and procedure, E.P. Act, 1986- Preliminaries, Power of Central Govt. to take measures to protect and improve environment, power to give directions, provisions under prevention, control and abatement of pollution, cognizance of offences, delegation of power.

MODULE-III


Text Books:-
2. Lal’s Law Book, Vol- I & II

Reference Book:-
MODULE-I
Computer Aided Design (CAD)-Engineering design steps, software and analytical tools, requirement of CAD language. Population forecast programme arithmetic increase method, geometric increase method, incremental increase method logistic curve method.

MODULE-II
Water supply treatment programme- Rising main design, pumping Module, service reservoir capacity calculation, Distribution network analysis and design- one to three loops. Water treatment Modules design- plain sedimentation tank, flocculator tank, filters, Mechanical rapid mix Module.

MODULE-III
Sewer design, waste water treatment Modules, screen, Grit chamber, Secondary settling tank, ASP, Trickling filter, Waste stabilization pond, oxidation ditch, sludge digester, sludge drying beds and septic tanks.

Control quality programme on stack effective height calculation. Gaussian plume model for gaseous and particulate dispersion from point source, line source, Gaussian model, Instantaneous puff dispersion model.
INDUSTRIAL HEALTH, SAFETY AND MANAGEMENT (3-0-0)

Module –I

Industrial hazards:- Occupational hazards and pollution, Hazards in open cast and underground mines, Hazards in storage, Handling and use, Hazards in work place, Hazards due to improper house keeping, Hazards in construction industries.

Module-II

Industrial safety:- Accident, Injury, dangerous occurrence, Unsafe acts, Errorover sight, Mistakes etc. Safety department, Safety department, Structure and function of safety committee staff, leadership styles in safety management communication, Department in motivation, Physiological factors in Industrial safety.

Module-III


Books:-

1. Industrial safety – Hand Book II\textsuperscript{nd} Ed . Handly, Mc. Graw Hill Book Co. UK
ENVIRONMENTAL ASPECTS OF DEVELOPMENTAL PROJECTS (3-0-0)

MODULE-1
Introduction: Environment, Sustainable Development, Quality of Life (GDP, GNP), Need for Development and Environmental Protection, Ambient and Effluent Emission Standards, Regulation for Environmental Pollution Control, Environmental Ethics.
Infrastructure Project: Highways, Airports, Water Supply and Sanitation, Wastewater Treatment- Salient Details and Environmental Aspects.
Construction Projects: Construction activities and their environmental effects, Mitigation Measures

MODULE –II
Watershed Development:
(a) Reservoirs & Dams: Micro-climatic changes, Submergence of land, forest & habitation - social effects. Effects on Flora & Fauna, Pollution accumulation on Sediments, Reservoir Sedimentation.
(b) Irrigation & Agricultural Activities: Water logging, Malaria Cause and Salinity Problems. Mitigative measures for Environmental Protection.

MODULE –III

TEXT BOOKS:
3. UNEP /UNDP, Environment and Sustainable Development.

REFERENCE BOOK:

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