Biju Patnaik University of Technology, Orissa

CIVIL ENGINEERING

3rd SEMESTER				4th SEMESTER			
THEORY		*Contact Hours*		*THEORY*		*Contact Hours*	
Code	Subject	L-T-P	Credits	Code	Subject	L-T-P	Credits
BSCM1205	Mathematics – III	3-0-0	4	BSCM1210	Mathematics – IV	3-0-0	4
HSSM3204	Engineering Economics & Costing	3-0-0		HSSM3205	Organisational Behaviour	3-0-0	
	or		3		or		3
HSSM3205	Organisational Behaviour	3-0-0		HSSM3204	Engineering Economics & Costing	3-0-0	
BECS2212	C++ & Object Oriented Programming	3-0-0	3	PCCE4204	Structural Analysis-1	3-0-0	3
PCME4202	Mechanics of Solids	3-0-0	3	PCCE4205	Surveying -1	3-0-0	3
PCCE4203	Building Material & Building Construction	3-0-0	3	PCCE4206	Geo Technical Engineering	3-0-0	3
PCME4201	Fluid Mechanics and Hydraulic Machines	3-1-0	4		**Free Electives**(any one)	3-0-0	3
				FEEC2216	Analog & Digital Electronics,		
				FECS2208	Data Base Management Systems		
				FEEE2215	Energy Conversion Technique.		
	Credits (Theory)		20		Credits (Theory)		19
PRACTICALS/SESSIONALS				*PRACTICALS/SESSIONALS*			
BECS7212	C++ & Object Oriented Programming Lab	0-0-3	2	PCCE7209	Material Testing Lab	0-0-3	2
HSSM7203	Communication and Interpersonal Skills for Corporate Readiness	0-0-3	2	PCCE7210	Hydraulics Laboratory	0-0-3	2
PCCE7207	Civil Engineering Drawing	0-0-3	2	PCCE7205	Survey Field Work-I	0-0-3	2
	Credits (Practicals / Sessionals)		6		Credits (Practicals / Sessionals)		6
	TOTAL SEMESTER CREDITS		26		TOTAL SEMESTER CREDITS		25

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

HSSM3204 Engineering Economics & Costing

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

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

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

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

Module-III: **(12 hours)**

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

Text Books:

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

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

HSSM 3205 **Organizational Behaviour**

Module I :

The study of Organizational Behaviour : Definition and Meaning, Why Study OB
Learning – Nature of Learning, How Learning occurs, Learning and OB.
Foundations of Individual Behaviour : Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.
Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Module II :

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

Module-III :

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

Text Books :

1. Keith Davis, Organisational Behaviour, McGraw-Hill.
2. K.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

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.

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.

9. Close - coiled helical springs.

TEXT BOOKS

1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning

REFERENCE BOOKS

1. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
3. Mechanics of Materials by William F.Riley, Leroy D.Sturges and Don H.Morris, Wiley
   Student Edition
4. Mechanics of Materials by James M. Gere, Thomson Learning
5. Engineering Machanics of Solids by Egor P. Popov, Prentice Hall of India
6. Strength of Materials by S.S.Rattan, Tata Mc Graw Hill
7. Strength of Materials by R.Subramaniam, Oxford University Press
8. Strength of Materials by Sadhu Singh, Khanna Publishers

PCCE4203 Building Materials and Building Constructions

Module I

Bricks: Brick as a construction material and its importance, materials suitable for manufacture of bricks, methods of brick manufacture, types of bricks, qualities of a good brick, testing of bricks, uses of bricks.

Stone: Introduction, classification, composition and characteristics, useful Indian stone, method of quarrying and dressing

Cement: Classification, chemical composition, Manufacturing of cement, hydration, tests for cement, uses of cement, types of cement, *Mortar:* Definition, composition and uses of mortar.

Concrete: Quality of mixing water, Workability, Factors affecting workability, Measurement of workability, Segregation, Bleeding, Uniformity of mixing, Mixing time, vibration of concrete, concrete mix design, admixtures, Grade and strength of Concrete.

Module II :

Foundation: Types of foundation, spread foundations, pile foundations, pier foundations, excavation of foundation

Brick Masonry: Terminology used, Materials used, Causes of failure of brick masonry, Types of bonds, Brick laying, Joints in brickwork, Reinforced brickwork, Joint between old and new masonry, Maintenance of brick work.

Stone Masonry: Terminology used, Materials used, Cutting and dressing of stones, Types of stone masonry- Rubble and Ashlar, General principles of construction, Joints of stone, Stone lining, maintenance of stone work, Artificial stones.

Cavity walls: Purpose and method of construction.

Module III :

Damp Proofing: Causes and effects, materials used for damp proofing, methods of preventing dampness, Damp Proof Course.

Stairs: Terms used, types of stairs, essential requirements, wooden stairs, concrete stairs, metal stairs.

Flooring: Types of flooring and their construction- brick, stone, concrete, tile, mosaic, terrazzo, asphalt

Plastering: Definition. Materials used for plastering, types of plastering, methods of plastering, defects and remedial measures in plastering.

Maintenance of Buildings: Causes and prevention of cracks in building, special repair of buildings, annual maintenance.

Text Books:

1. "Material of Construction ", D.N.Ghose, TMH Publishing Company Ltd.

2. "Engineering Materials" by S. C. Rangwala et al., Charotar Publishing House

3. A text book of Building Construction by S K Sharma and B.K Kaul, S Chand & Company Limited.

4." Building Construction", Sushil Kumar, Standard Publishers Distributors, New Delhi

Reference Books:

1. "Properties of concrete" by A M Neville, Low Price Edition

2. "Building Construction" by S P Arora.

3. "Building Materials" by S.K.Duggal, TMH Publication.

PCME4201 Fluid Mechanics and Hydraulic Machines

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.

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

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

Module 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.

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

Module III   **(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
3.   Fluid Mechanics, A.K.Jain, Khanna Publishers

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
7.   Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson Education

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)

HSSM7203 Communication & Interpersonal skills for Corporate Readiness Lab.

Lab   **30 hours**

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

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

1.   Gaining entry into an organization

   i.   Preparing job-applications and CVs

   ii.   Facing an interview

   iii.   Participating in group discussion (as part of the recruitment process)

2   In-house communication

a.   Superior/ Senior ➔ subordinate / junior (individual ➔ individual / group)
   i.   Welcoming new entrants to the organization, introducing the workplace culture etc.
   ii.   Briefing subordinates / juniors : explaining duties and responsibilities etc.
   ii.   Motivating subordinates / juniors ('pep talk')
   iii. Instructing/ directing subordinates/ juniors
   iv.   Expressing / recording appreciation, praising / rewarding a subordinate or junior
   v   Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking for an explanation etc.

b.   Subordinate / Junior ➔ Superior / Senior
   i.   Responding to the above
   ii.   Reporting problems / difficulties / deficiencies
   iii.   Offering suggestions

PCCE7207 Civil Engineering Drawing

Plan, elevation, side view of residential/office building

Drawing of 2 bed room/3 bed room houses (single and two storeyed), ground and first floor plans, elevation and section for load bearing and framed structures

Detailing of doors/windows

Drawing of several types of footing, bricks work, floor, staircases, masonry, arches and lintels

Types of steel roof trusses

Detailing of floor and wall joints,

Project on establishments like Bank building/ Post office/ Hostel/ Library/ Hospital/ Auditorium etc

References

1. Civil Engineering Drawing and Design by D.N.Ghose CBS Publisher
2. Civil Engineering Drawing by

BSCM1210 **Mathematics – IV**

Module-I   **(20 hours)**

Numerical methods:
Approximation and round of errors, Truncation error and Taylor's series
Roots of equation: The bisection method, the false-position method, fixed point iteration, the Newton-Raphson method, Muller's method
Linear algebraic equation: LU decomposition, the matrix inverse, Gauss-Seidel method
Interpolation: Newton divided difference interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.
Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss quadrature
Ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods

Module-II   **(10 Hours)**

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

Module-III   **(10 Hours)**

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

Text books:

1. S. C. Chapra and R. P. Canale, " _Numerical methods for Engineers_", Fifth Edition, McGraw Hill Education
   Reading Chapters : 2, 3(3.1, 3.2), 4(4.2, 4.3), 5(5.1, 5.2, 5.3), 6(6.4), 9(9.1, 9.2), 10(10.2), 13(13.1,13.2,13.5), 16(16.1, 16.2), 17(17.3), 20(20.1, 20.2, 20.3)

2. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India
   Reading Chapters: 22, 23(except 23.5 and 23.8)

Reference books:

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

PCCE4204 **Structural Analysis - I**

Module I

Introduction to statically indeterminate structures with reference to two and three dimensional structures. Determination of static and kinematic indeterminacy in beams and frames

Three moment theorem, Continuous beams and propped cantilevers by consistent deformation method, Fixed beams

Module II

Rolling loads and influence lines for simply supported beams, ILD for reaction, shear force and bending moment at a section, ILD for wheel loads, point loads and udl, maximum bending moment envelope

Analysis of three hinged arches, Suspension cable with three hinged stiffening girders subjected to dead and live loads, ILD for Bending Moment, Shear Force, normal thrust and radial shear for three hinged arches

Module III

Energy theorems and its application (Displacement calculation):

Strain energy method, Virtual work method, unit load method, Betti's and Maxwell's laws, Castigliano's theorem, concept of minimum potential energy. Analysis of redundant plane trusses.

Deflection of pin jointed plane trusses. Analytical method and Williot –Mohr diagram. Introduction to space truss

Text Books:
1. Theory and Problems in Structural Analysis by L Negi, Tata Mc Graw Hill
2. Structural Analysis by Norris and Wilber

Refernce Books:
3. Structural Analysis by V. S. Prasad, Galgotia Publications Private Limited
4. Analysis of Structure by R C Hibller

PCCE4205 **Surveying - I**

Module I

Linear measurement and chain survey: Use of various types of chains and tapes, measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination.

Compass surveying: Use of prismatic compass, temporary adjustment, bearing of a line, local attractions, correction of bearing

Plane table surveying: Methods of plane tabling, radiations, intersection, traversing and resection, two point and three point problem. Adjustment and common error in plane table survey.

Module II

Levelling: Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Curvature and refraction error, sensitiveness of level tube, reciprocal levelling, levelling difficulties and common errors

Module III

Contouring: Contour interval and horizontal equivalent, characteristics of contours, methods of contouring- different and indirect method, contour gradient

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing

Text Books:
1. "A Text Book of Surveying-I", S.K.Duggal, TMH Publisher
2. Surveying- Vol-1, B.C. Punmia

Reference Books:
3. Surveying and Levelling Vol-1, T. P. Kanetkar and S. V. Kulkarni
4. Surveying Vol-1 by R Agor

PCCE4206 **Geotechnical Engineering**

Module 1:

Origin of Soil and Grain Size**:** Rock Cycle and the origin of soil, soil particle size, clay minerals, mechanical analysis of soil, grain size distribution curve, particle shape, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density, Consistency of soil: Atterberg limits - liquid limit, plastic limit, shrinkage limit. Liquidity index and consistency index, activity, soil structure. Engineering classification of soil: IS, USCS, HRB and ASTM.   (8 Hours)

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.   (6 Hours)

Module II:

Soil Compaction: mechanism and principles, Standard and Modified Proctor Test, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.   (4 Hours)

Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzhaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation.   (4 Hours)

Stresses in Soil: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.   (6 Hours)

Module III

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test. Other methods of determining the un-drained shear strength of soil, sensitivity and thixotropy of clay.   (7 Hours)

Stability of Slopes: Terminology, stability of finite and infinite slopes, Swedish slip circle method and friction circle method of analysis of slopes, Taylor stability Number and stability curves, Bishops Method.   (7 Hours)

Text Books:
  (1) Principles of Geotechnical Engineering by Braja M. Das, Thomson/ Brooks Cole
  (2) Geotechnical Engineering by T.N. Ramamurthy & T.G. Sitharam,S. Chand & Co.
Reference Books:
  (3) Geotechnical Engineering by Donald P. Coduto, Pearson Education, Prentice Hall
  (4) Soil Mechanics and Foundation Engineering by B. C Punmia et al., Laxmi Publications Pvt Ltd

BEEC2216 **Analog and Digital Electronics**

MODULE – I **(9 Hours)**

1. **Diode Circuits:** Zener Diode Voltage Regulator, Diode Circuits with Time-Varying Sources, Switching Characteristics of a Diode, Special Purpose Diodes , Rectifiers and Filters. (4 Hours)

2. **Small Signal Amplifier:** Transistor Hybrid Model, Transistor Biasing, Bias Design, AC Gain, Input and Output Impedances, Some Special Circuits, Darlington Pairs and Feedback Pairs, Frequency Response of Single Stage RC Coupled Amplifiers and Multistage Transistor Amplifiers. (5 Hours)

MODULE – II (12 Hours)

3. **Large Signal Amplifiers:** Classification, Class-A and Class-B Power Amplifiers Complimentary and Symmetry Amplifiers, Class-C Amplifiers. . (4 Hours)
4. **Feed Back Amplifiers and Oscillators:** Feedback Concepts, Types of Feedback Circuits, Effects of Negative Feedback Circuits, Unijunction Oscillator and PLL. (4 Hours)
5. **Operational Amplifier:** Basic Operational Amplifier, Differential Amplifier, Basic Operational Amplifier Circuits, Application of OPAMPs, Linear Application of OPAMPs, OPAMP Filters.

 (4 Hours)

MODULE – III (13 Hours)

6. **Conditional Circuits:** Introduction to Digital Electronics Circuits, K-maps and their Simplification, Adder, Subtractors, Digital Comparator Circuits, Parity Checkers/Generators, Multiplexers and Decoders, Demultiplexers/Decoders, Programmable Logic Arrays. (5 Hours)
7. **Sequential Circuits and Systems:** Introduction, Memory Cells and Flip-Flops, Resistors, Counters, Asynchronous Counters, State Diagrams, Memories, ROM and RAM, Digital to Analog and Analog to Digital Converters (DAC and ADC).

 (5 Hours)
8. **Multivibrators and Switching Regulators:** Multivibrators, Analog Multivibrators, 555 Timer, Power Supply and Regulators (3 Hours)

Text Books:

1. Electronics: Analog and Digital, I.J. Nagrath (Selected portions of Chapter 1, 3, 4, 5, 6, 7, 9, 10, 11), PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Millman's Electronic Devices and Circuits, 2nd Edition, J. Millman, C. Halkias, and S. Jit, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Electronic Devices and Circuit Theory, 9th/10th Edition, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi.
3. Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.
4. Fundamentals of Digital Circuits, 2nd Edition, A. Anand Kumar, PHI Learning Pvt. Ltd., New Delhi.

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

BEEE2215 **Energy Conversion Techniques**

MODULE- I (10 Hrs)

1. <u>DC GENERATORS</u>: 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. <u>DC MOTORS</u>: 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. <u>SINGLE PHASE TRANSFORMERS</u>: 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. <u>INDUCTION MOTORS</u>: (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. <u>THREE PHASE SYNCHRONOUS GENERATORS</u>: Constructional Features, Principle of operation as Alternator, Synchronous reactance, Equivalent circuit of alternator, Power-Angle curve, Synchronization of alternators.

6. <u>THREE PHASE SYNCHRONOUS MOTORS</u>: Constructional Features, Principle of Operation, Torque Expression and Phasor Diagram for Synchronous Motor, Electrical Power and Mechanical Power, Starting and application of Synchronous Motor.

Text Book :

1.   Electric Machines – D P Kothari & I J Nagrath – Tata McGraw Hill.

Reference Book(s):

2.   The Performance and Design of DC Machines – A E Clayton.

3.   Theory and Performance of AC Machines – M G Say

4.   Electrical Machinery – P S Bimbhra – Khanna Publishers.

5.   Electrical Machines – P K Mukherjee and S Chakravorti – Dhanpat Rai Publications.

6.   Electric Machinery – Fitzgerald, Charles Kingsley Jr., S. D. Umans – Tata Mc Graw Hill.

7.   Electric Machinery And Transformers – Guru & Hiziroglu – Oxford University Press.
8.   Electric Machines – Charles Hubert – Pearson Education

PCCE7209 Material Testing Lab

*Brick***:**   (a) Shape and size test for brick
         (b) Water absorption test for brick
         (c) Compressive strength of brick

*Cement***:**   (a) Fineness of cement
         (b) Soundness of cement by Lechattelier test
         (c) Specific gravity of cement
         (d) Fineness of cement by air permeability
         (e) Standard consistency of a given sample by Vicat test
         (f) Initial and final setting time of cement
         (g) Fineness modulus of fine and coarse aggregate
         (h) Aggregate crushing value of coarse aggregate
         (i) Compressive strength of cement mortar
         (j) Tensile strength of cement mortar

*Steel***:**   (a) Compression test of cast iron
         (b) Rigidity modulus of cast iron
         (c) Fatigue test of steel (cyclic loading)
         (d) Tensile strength of steel

PCCE7210 Hydraulic Machines Lab

Group-I
1. Proof of Bernoulli's Theory
2. Friction Flow through Pipes
3. Determination of Reynold's Number.
4. Determination of Metacentric Height

Group-II
1. Determination of Coefficient of Discharge for V-notch
2. Determination of Coefficient of Discharge for Venturimeter
3. Impact of Jets
4. Flow through orifice

Gropup-III
1. Proof of Stoke's law
2. Work done by Pelton Wheel Turbine
3. Efficiency of Francis Turbine.
4. Discharge through Centrifugal Pump.

PCCE7205 **Survey Field Work**

1. Testing of chain measurement of correct length of the line
2. Traversing by chain survey
3. Traversing by compass survey
4. Intersection method of plane table survey
5. Traversing by plane table
6. Use of dumpy level and fly leveling
7. Longitudinal Section and Cross Section of Road
8. Contouring
9. Measurement of horizontal and vertical angle by theodolite
10. Traversing by the odolite

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA
CIVIL ENGINEERING

5th SEMESTER				6th SEMESTER			
THEORY		Contact Hours		*THEORY*		Contact Hours	
Code	Subject	L-T-P	Credits	Code	Subject	L-T-P	Credits
HSSM3303	Environmental Engineering & Safety	3-0-0		HSSM3301	Principles of Management	3-0-0	
	or		3		or		3
HSSM3301	Principles of Management	3-0-0		HSSM3303	Environmental Engineering & Safety	3-0-0	
PCCI4303	Advanced Mechanics of Materials	3-0-0	3	PCCI4304	Structural Analysis -II	3-0-0	3
PCCI4302	Transportation Engineering- I	3-0-0	3	PCCI4305	Irrigation Engineering	3-0-0	3
PCCI4301	Design of Concrete Structures	3-0-0	3	PECI5301	Design of Steel Structure	3-0-0	3
	Professional Elective – I (*Any One*)	3-0-0	3		Professional Elective – I (*Any One*)	3-0-0	3
PECI5303	Surveying - II			PECI5304	Transportation Engineering - II		
PECI5302	Remote Sensing & GIS						
				PECI5305	Pavement Design		
	Free Elective – II (*Any One*)	3-0-0	3		**Free Elective – II (*Any One*)**	3-0-0	3
PCCS4301	Computer Organization			HSSM3302	Optimization in Engineering		
PCIT4303	Java Programming			PEME5308	Non-conventional Energy sources		
FESM6302	Advance Numerical Methods			PEIT5301	E-Commerce		
	Credits (Theory)		18		Credits (Theory)		18
	PRACTICALS/SESSIONALS				*PRACTICALS/SESSIONALS*		
PCCI7301	Concrete & Structural Engg Lab.	0-0-3	2	PCCI7305	Environmental Engineering Lab.	0-0-3	2
PCCI7302	Geotechnical Engineering Lab.	0-0-3	2	PCCI7306	Transportation Engineering Lab- I.	0-0-3	2
PCCI7303	Design & Detailing of Concrete StructureLab	0-0-3	2	PCCI7304	Design & Detailing of Steel Structure Lab	0-0-3	2
	Credits (Practicals / Sessionals)		6		Credits (Practicals/Sessionals)		6
	TOTAL SEMESTER CREDITS		24		TOTAL SEMESTER CREDITS		24
	TOTAL CUMULATIVE CREDITS		131		TOTAL CUMULATIVE CREDITS		155

HSSM3303 ENVIRONMENTAL ENGINEERING & SAFETY
(3-0-0)

Module – I
Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle etc., Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental Engineering: Atmospheric chemistry, Soil chemistry. Noise pollution-Noise standards, measurement and control. Water Treatment: water quality standards and parameters, Ground water. Water treatment processes, Pre-treatment of water, Conventional process, Advanced water treatment process.

Module – II
(a)Waste Water Treatment: DO and BOD of Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production.
(b)Air Pollution : Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –greenhouse gases, non-criteria pollutants, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NOx removal, Fugitive emissions.
(c) Solid waste, Hazardous waste management, Solid Waste Management, Source classification and composition of MSW: Separation, storage and transportation, Reuse and recycling, Waste Minimization Techniques. Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment: Incinerators, Inorganic waste treatment. E.I.A., Environmental auditing,

Module – III
Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integratednsteel industry, Petroleum Refinery, L.P.G. Bottling, Pharmaceutical industry. Fire Prevention – Detection, Extinguishing Fire, Electrical Safety, Product Safety. Safety Management- Safety Handling and Storage of Hazardous Materials, Corrosive Substances, Gas Cylinders, Hydro Carbons and Wastes. Personal Protective Equipments.

Text Book :
1. Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Environmental Engineering by Prof B.K. Mohapatra, Seven Seas Publication, Cuttack
3. Industrial Safety Management, L. M. Deshmukh, Tata McGraw Hill Publication.

Reference Books
1. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero PHI Publication
2. Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
3. Environmental Science, Curringham & Saigo, TMH,
4. Man and Environment by Dash & Mishra
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.
6. Industrial Safety Management and Technology, Colling. D A – Prentice Hall, New Delhi.

HSSM3301 **PRINCIPLES OF MANAGEMENT** (3-0-0)

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.
Modern Concept of Marketing, The Functional Classification of Marketing, Functions of a Marketing Management, Marketing Mix, Fundamental Needs of Customers, The Role of Distribution channels in Marketing, Advertising, Marketing, Consumerism and Environmentalism.

Module III: Financial Function & HRM Functions.
Financial Functions, Concept of Financial Management, Project Appraisal, Tools of Financial decisions making, Overview of Working Capital.
HRM Function of Management: Human Resource Management, Human Resource Development, Importance of HRM, Overview of Job Analysis, Job Description, Job Specification, Labour Turnover. Manpower Planning, Recruitment, Selection, Induction, Training and Development, Placement, Wage and Salary Administration, Performance Appraisal, Grievance Handling, Welfare Aspects.

Reference Books:
1. *Business Organization & Management, CR Basu, TMH*
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.*
6. *Modern Business Organisation & Management by Sherlekar, Himalaya Publishing House.*

PCCI4303 **ADVANCED MECHANICS OF MATERIAL** (3-0-0)

Module I
Theories of failure: Maxm principal stress theory, maxm shear stress theory, maxm strain theory, total strain energy theory, maxm distortion theory, octahedral shear stress theory graphical representation and comparision of theories of failure

Thick cylinders subjected to internal and external pressures compound cylinders, computer application in analyzing stresses in thick cylinders.

Unsymmetrical bending: Properties of beam cross selection, slope of neutral axis, stresses and deflection in unsymmetrical bending, shear centre.

Module II
 Curved Beam: Bending of beam with large initial curvature, Stress distribution in beam with rectangular, circular and trapezoidal cross section, stresses in crane hooks, ring and chain links.

Elementary concept of theory of elasticity, stresses in three dimensional, equations of equilibrium and compatibility, plane stress, computer analysis of two dimensional state of stress or strain at a point.

Module III
Advanced topics in strength of materials: Repeated stresses and fatigue in metals, concept of stress, Concentration, notch and stress concentration factors.
 Experimental stress analysis: Resistance strain gauges, strain Rosettes, Two dimensional photoelastic methods of stress analysis, stress optic law, light and dark field in a polariscope, Isoclinic and Isochromatic fringe patterns, Computer Analysis of strain from strain rosette measurement.

Textbook:
1 Advanced Mechanics of Solids, L.S. Srinath, TMG.
2. Advanced Mechanics of Materials, Kumar & Ghai, Khanna Publisher.
3. Advanced Mechanics of Materials: Seely and Smith, John Willey, New York.
4. Mechanics of Materials by Gere & Timoshenko, CBS.

PCCI4302 TRANSPORTATION ENGININEERING-I (3-0-0)

Module-I
Modes of transportation, importance of highway transportation, history of road construction. Principle of highway planning, road development plans, highway alignments requirements, engineering surveys for highway location.
Geometric design- Design controls, highway cross section elements, cross slope or camber, road width, road margins, typical cross sections of roads, design speed, sight distance, design of horizontal and vertical alignments, horizontal and vertical curves.

Module-II
Highway Materials:-
Properties of subgrade , sub-base , base course and surface course materials , test on subgrade soil, aggregates and bituminous materials .
Traffic Engineering definition , fundamentals of traffic flow , traffic management, prevention of road accidents , elements of transport planning , highway drainage, pavement failures and maintenance , strengthening.

Module-III
Factors affecting flexible pavement and rigid pavement design. Introduction to IRC method of pavement design. Construction procedure of flexible and rigid pavements. Bridge site selection, economic span of bridge , bridge superstructures , foundations , sub-structures and approaches.

Reference Books:
1. Highway Engineering, by S.K.Khanna and CEG Justo
2. A course in Highway Engineering by Dr. S.P. Bindra
3. Principles and practice of Bridge Engineering by Dr. S.P. Bindra

PCCI4301 DESIGN OF CONCRETE STRUCTURES (3-0-0)

Module I : Properties of concrete and reinforcing steel, philosophy, concept and methods of reinforced concrete design, introduction to limit state method, limit state of collapse and limit state of serviceability, application of limit state method to rectangular beams for flexure, shear, bond and torsion

Module II : Design of doubly reinforced beams, design of T and L beams, design of one way and two way slabs, design of staircases.

Module III: Design of short and long columns with axial and eccentric loadings, Design of isolated and combined column footings

Reference Books:
1. Limit State Design-A.K.Jain, Neemchand & Bros, Roorkee
2. Design of concrete structures by J.N.Bandyopadhyay, PHI pvt ltd.
3. Limit State Design of Reinforced Concrete -P.C Verghese
4. RCC Design-B.C.Punmia, A.K.Jain and A.K.Jain-Laxmi Publications
5. Design of Reinforced Concrete Structures: Pillai & Mennon, TMH Publ

PECI5303 SURVEYING-II (3-0-0)

MODULE-I

Tacheometry: General principles of stadia system, determination of tacheometric constants, analytic lens, fixed and movable hair methods, inclined sights with staff vertical, inclined sight with staff normal to the line of sight, tangential system, errors in tacheometer

Curves: Types of curves, elements of curve, different methods of setting out simple circular curves, compound curves, reverse curves, transition curves, types of transition curves, super elevation, vertical curves.

MODULE-II

Triangulation: Classification of triangulation system, operation in triangulation survey, reconnaissance, selection of site for base line, its measurement and extension, correction to base line measurement using EDM and Total station, selection of stations, triangulation figures, scaffolds and signals, marking of stations, inter visibility, strength of figures, reduction to centre.

Theory of Errors: Definitions, law of weight, probable errors, most probable value, distribution of error, normal equations, method of least square

MODULE-III

Setting out of work: Laying out of buildings and sewer lines.

Photogrammetry: Basic concepts, type of photographs, Terrestrial Photogrammetry, Aerial Photogrammetry: stereoscopy and parallax.

Books :
1. Surveying Volume II and III : B.C. Punmia
2. Surveying –Volume II: S.K.Duggal, TMH Publ
3. Advance Surveying : R. Agor

PECI5302 REMOTE SENSING & GIS (3-0-0)

MODULE-I

Remote sensing- introduction, physics of remote sensing- electromagnetic radiations and their characteristics, thermal emissions, multi-concept in remote sensing, remote sensing satellites and their data products, sensors and orbital characteristics, spectral reflectance curves for earth surface features, methods of remotely sensed data interpretation- visual interpretation, concept of fcc, digital image processing- digital image and its characteristics, satellite data formats, image rectification and restoration, image enhancement- contrast manipulation, spatial feature manipulation, multi-image manipulation

MODULE-II

Fundamentals of GIS: introduction, definition of GIS, evolution of GIS, roots of GIS, definition, GIS architecture, models of GIS, framework for GIS, GIS categories, map as a model, spatial referencing system, map projections, commonly used map projections, grid systems, cartographic symbolization, types of maps, typography, map design, map productions, map applications, data management, models and quality issues: conceptual models, geographical data models, data primitives, data types - raster and vector approach, digital terrain modeling , approaches to digital terrain data modeling , acquisition of digital terrain data, data modeling and spatial analysis, sources of geographical data, data collectors and providers, creating digital data sets, data presentation, data updating, data storage

MODULE-III

GIS data processing, analysis and visualization: raster based GIS data processing, vector based GIS data processing, human computer interaction and GIS, visualization of geographic information, principles of cartographic design in GIS, generation of information product, image classification and GIS, visual image interpretation, types of pictorial data products, image interpretation strategy, image interpretation process,

Reference Books:
1. Remote Sensing And GIS, M.A. Reddy, B.S. Publication, Hyderabad
2. Introduction Of GIS, Kang-Tsung Chang, Tata Mcgraw-Hill, New Delhi
3. GIS, N. Panigrahi, University Press, Hyderabad

PCCS4301 **COMPUTER ORGANIZATION** (3-0-0)

Module –I   **12 Hrs**

Basic structures of Computers: Functional units, operational concepts, Bus structures, Software, Performance, Computer Architecture vs Computer Organization.
Machine Instruction and Programs: Memory location and addresses, Big-endian and Little-endian representation. Memory Operations, Instructions and instruction Sequencing, Addressing modes, Assembly Language, Basic Input/output operations, subroutine, additional Instructions.

Module – II   **12 Hrs**

Arithmetic : Addition and subtraction of signed Numbers, Design of Fast Adders, Multiplication of positive Numbers, Signed-operand multiplication , Fast multiplication, Integer Division, Floating- point Numbers, (IEEE754 s…) and operations.

Module – III   **12 Hrs**

Basic Processing units: Fundamental concepts, execution of complete Instructions, Multi bus organization, Hardwired control, Micro programmed control, RISC vs CISC architecture.

Memory System: Basic Concepts, cache Memory, Cache memory mapping policies, Cache updating schemes, performance consideration, Virtual memories, Paging and Page replacement policies, Memory Management requirement, secondary storage.

Text Books:

1. Computer Organization:Carl Hamacher, Zvonkovranesic, Safwat Zaky,Mc Graw Hill,5th Ed

2. Computer Organization and Design Hardware/ Software Interface: David A. Patterson, John L. Hennessy, Elsevier, 4th Edition.

Reference Book :

1. Computer Architecture and Organization: William Stallings, Pearson Education.
2. Computer Architecture and Organizations, Design principles and Application: B. Govinda Rajalu, TMH Publishing company Ltd.
3. Computer Architecture: Parhami, Oxford University Press
4. Computer system Architecture: Morris M. Mano PHI NewDelhi.
5. Computer Architecture and Organization: John P. Hayes Mc Graw Hill introduction.
6. Structured Computer Organization: A.S. Tanenbum, PHI
7. Computer Architecture And Organization: An Integrated Approach, Murdocca, Heuring Willey India, 1st Edition.

PCIT4303 JAVA PROGRAMMING (3-0-0)

Module – I   **12 Hrs**
Introduction to Java and Java programming Environment. Object Oriented Programming.
Fundamental Programming Structure: Data Types, variable, Typecasting Arrays, Operators and their precedence.
Control Flow: Java's Selection statements (if, switch, iteration, statement, while, do-while, for, Nested loop).
Concept of Objects and Classes, Using Exiting Classes building your own classes, constructor overloading, static , final, this keyword .
Inheritance: Using Super to Call Super class constructor, Method overriding, Dynamic method Dispatch, Using Abstract Classes, Using final with inheritance. The Object Class.
Packages & Interfaces : Packages, Access Protection, Importing package, Interface, Implementing Interfaces, variables in Interfaces, Interfaces can be extended.
Exception Handling: Fundamentals, Types Checked , Unchecked exceptions, Using try & catch, Multiple catch, throw , throws, finally, Java's Built in exceptions, user defined exception.

Module - II   **12 Hrs**
Multi Threading: Java Thread Model, Thread Priorities, Synchronization, Creating a thread, Creating Multiple threads, Using isAlive ( ) and join ( ), wait () & notify ( ).
String Handling: String constructors, String length, Character Extraction, String Comparison, Modifying a string.
Java I/O: Classes & Interfaces, Stream classes, Byte streams, Character streams, Serialization.
JDBC: Fundamentals, Type I, Type II, Type III, Type IV drivers.
Networking: Basics, Socket overview, Networking classes, & interfaces, TCP/IP client sockets, whois, URL format, URL connection, TCP/IP Server Sockets.

Module - III   **12 Hrs**
Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets, Applet context and show documents ().
Event Handing: Delegation Event model, Event Classes, Event Listener Interfaces, Adapter classes.
AWT: AWT Classes window fundamentals, component, container, panel, Window, Frame , Canvas, Creating a frame window in an Applet , working with Graphics , Control Fundamentals , Layout managers, Handling Events by Extending AWT components.
Core java API package, reflection, Remote method Invocation (RMI)
Swing: J applet, Icons & Labels, Text fields, Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees, Tables.
Exploring Java-lang: Simple type wrappers, Runtime memory management, object (using clone () and the cloneable Interface), Thread, Thread Group, Runnable.

Text Books:
1. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.
2. Big Java: Horstman, Willey India, 2nd Edition.
3. Java The complete reference: Herbert Schildt, TMH, 5th Edition.

Reference Books:
1. Balguruswamy, Programming with JAVA, TMH.
2. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.

FESM6302 **ADVANCE NUMERICAL METHODS** (3-0-0)

Unit-I :   (10 Hr)
Interpolation: Piecewise Linear Interpolation, Piecewise Quadratic Interpolation, Piecewise Cubic Hermite Interpolation, Piecewise Spline Interpolation.
Numerical Differentiation: First Derivative, Higher Derivatives, Partial Derivative, Richardson's Extrapolation.
Romberg algorithm for numerical integration.

Unit-II   (10 Hr)
Eigen values and Eigen Vectors: Basic power method, Rayleigh Quotient, Shifted power method, Accelerating convergence, Inverse power method, Basic QR method, Better QR method, Finding eigen vectors, Accelerating convergence
Fourier methods: Discrete Fourier Transforms, Fast Fourier Transforms, Matrix form of FFT, Algebraic form of FFT, Mixed-Radix FFT

Unit-III   (10 Hr)
Ordinary Differential Equations: Adams-Bashforth Methods, Adams-Moulton Methods, Adams Predictor-Corrector methods, Other Predictor-Corrector methods (Simpson's method and Milne's method)
Parabolic Partial Differential Equation: Explicit Method, Implicit method, Crank-Nicolson method
Hyperbolic Partial Differential Equation: Explicit Method, Implicit method.
Elliptic Partial Differential Equation: Finite-Element method.

Text Book:
1. L.V. Fausett," Applied Numerical Analysis Using MATLAB", Pearson Education

Reference Books:
1. W.Cheney and D. Kincaid,"Numerical Mathematics and Computing", Fifth Edition, Thomson/CENGAGE Learning
2. S.C.Chapra,"Applied numerical methods with MATLAB", second edition, Tata McGraw Hills
3. R.J. Schilling and S.L.Harris,"Applied Numerical Methods for Engineering", CENGAGE learning

PCCI7301 CONCRETE & STRUCTURAL LAB - 1 (0-0-3)

1. Workability test of concrete
   Slump test, compaction factor test and flow table test
2. Cube Test of Concrete(Nominal Mix)
3. Cylinder Test for Concrete(Nominal Mix): Determination of axial stress, longitudinal strain, lateral strain and Poision's ratio. Plotting of stress-strain curve and determination of modulus of elasticity.
4. Split Tensile Strength Test of Concrete
5. Prism test for determining modulus of rupture of concrete
6. Design of Concrete Mix (As per Indian Standard Method)
7. Failure of RC beam in bending and shear (two point and one point loading)

PCCI7302 GEOTECHNICAL ENGINEERING LAB (0-0-3)
(Relevant I.S codes may be referred)

1. Determination of specific gravity of soil grains
2. Determination of grain size distribution of soil
(a)Sieve test (b) Hydrometer/ pipette test
3. Determination of Atterberg limits of soil
(a) Liquid limit (b) plastic limit (c) shrinkage limit
4. Measurement of soil compaction in the field
(a) Core cutter method (b) Sand replacement method
5. Determination of Density – Water content relationship of soil.
(a) Proctor compaction test (ii) Modified Proctor compaction test (c) Use of Proctor penetration needle
6. Determination of relative density of granular soil
7. Determination of shear strength parameters of soil
 (a) Shear Box test (b) Tri-axial compression test (c) Unconfined compression test (d) Vane shear test
8. Determination of consolidation characteristics of soil using fixed ring Oedometer
9. Determination of California Bearing Ratio (CBR) of soaked and un-soaked soil specimens
10. Determination of coefficient of permeability of soil
(a) Constant head permeameter (b) Falling head permeameter

PCCI7303 DESIGN & DETAILING OF CONCRETE STRUCTURES
(IS 456: 2000 and SP 16 are to be used)

Complete design of a simple load bearing residential building comprising of beams, slab, column, footing, staircases, etc.

PCCI4304 **STRUCTURAL ANALYSIS -II** (3-0-0)

Module - I
Plastic Analysis: Plastic modulus, shear factor, plastic moment of resistance, Load factor, Plastic analysis of continuous beam and simple rectangular portals, Application of upper bound and lower bound theorems

Module – II
Analysis of redundant plane truss (single degree), analysis of continuous beams and plane frames by slope deflection method and moment distribution method, analysis of Continuous beam and simple portals by Kani's method

Module - III
Analysis of two hinged and fixed arches for dead and live loads, Suspension cables with two hinged stiffening girders, introduction to force and displacement method, matrix, methods of analysis: flexibility and stiffness, methods; Application to simple trusses and beams
.
Reference Books:
1. Structural analysis by C.S. Reddy TMH Publ
2. Structural analysis a matrix approach by Pandit & Gupta, TMH Publ.
3.Indeterminate Structures: J.S.Kinney
4. Limit Analysis of Structures: Monikaselvam, Dhanpat Ray Publ
5. Indeterminate Structural Analysis: C.K.Wang ,TMH

PCCI4305 **IRRIGATION ENGINEERING** (3-0-0)

MODULE-I
1. **Introduction:** Necessity of Irrigation in India, Advantages and disadvantages of Irrigation, Techniques of water distribution in firms, Quality of irrigation water.
2. **Water requirements of Crops:** Crops and crop season, Duty and Delta, Consumptive use, Irrigation requirements, Estimation of consumptive use of water by climatic approaches, Irrigation efficiencies, Soil moisture-irrigation relationship.
3. **Canal Irrigation:** Classification of canals, Canal losses, Alignment of canals, Design of stable channels using Kennedy's and Lacey's theory, Garret's diagram, Cross section of irrigation canals
4. **Lining of Irrigation Canals:** Advantages and economics of lining, Various types of lining, Design of lined canals.

MODULE-II
5. **Reclamation of Water Logged and Saline Soils:** Causes and control of water logging. Reclamation of saline and alkaline land, Surface and Sub-surface drainage.
6. **Types of Cross-Drainage Works:** Types of CD works, Selection of a suitable type to suite a particular condition, Design consideration for CD works.
7. **Diversion Head works:** Weirs and Barrages, Types of weirs and barrages, Layout of a diversion head works, Introduction to different components of a diversion head works.
8. **Design of weirs and barrages:** Bligh's creep theory, Design of weir using Bligh's theory, Lane's weighted creep theory, Khosla's theory, Khosla's method of independent variables, Exit gradient.
9. **Canal Falls:** Necessity, Proper location, Types, Design and detailing of one type of fall.

MODULE-III
10. **Gravity Dams:** Typical cross section, Various forces acting on gravity dam, Combination of forces for design, Modes of failure and criteria for structural stability, High and low gravity dam, Design of high dam, Typical section of low gravity dam.
11. **Earth Dams:** Types, Causes of failure, Preliminary section of an earth dam, Seepage control in earth dams
12. **Spillways:** Descriptive study of various types of spillways**.**

Reference Books:
1. Irrigation Engineering and Hydraulic Structures by S. K. Garg, Khanna Publication, New Delhi
2. Irrigation Engg. By B.C. Punmia and Pande, Laxmi Publication, New Delhi
3. Irrigation Engg. By Birdie and Das, Dhanpat Rai, New Delhi
1. Irrigation Engg. By Sharma and Sharma, S. Chanda and Company, New Delhi

PCCI5301 DESIGN OF STEEL STRUCTURE (3-0-0)
(Based on limit state method as per IS:800-2007)

Module I

Introduction, advantages/disadvantages of steel, structural steel, rolled steel section, various types of loads, design philosophy

Limit state design method, limit states of strength and serviceability, probabilistic basis for design

Riveted, bolted and pinned connections,

Welded connections-assumptions, types, design of fillet welds, intermittent fillet weld, plug and slot weld, failure of welded joints, welded joints vs bolted and riveted joints

Module II

Tension members, types, net cross-sectional area, types of failure, slenderness ratio, design of tension members, gusset plate.

Compression members, effective length, slenderness ratio, types of cross-section, classification of cross-section, design of axially loaded compression members, lacing, battening, design of column bases, and foundation bolts.

Module III

Design of beams, types of c/s, lateral stability of beams, lateral torsional buckling, bending and shear strength, web buckling and web crippling, deflection, design procedure.

Plate girders- various elements and design of components

Eccentric and moment connections, roof trusses

Reference Books:
1. Limit State Design of Steel structures by S.K. Duggal, TMH Publication
2. Steel Structures- Design & Practice by N. Subramanian, Oxford University Press
3. Design of steel structures by S.S.Bhavikatti, I.K. International Publishing house, New Delhi.
4. Design of Steel Structures by K. S. Sairam- Pearson

PCCI5304 TRANSPORTION ENGINEERING-II (3-0-0)

Module-I
History of Indian railways, component parts of railway track, problems of multi gauge system, coning of wheels, alignments and survey, permanent way track components , Type of rail sections ,creep of rails, wear and failure in rails , Ballast requirements, sleeper requirements, types of sleepers, various train resistances

Module-II
Geometric design: Gradients and grade compensation, various speeds on a railway track, super-elevation, horizontal and vertical curves,
Points and crossings, Design of simple turn-out, Signalling and interlocking,

Module-III
Airport site selection, Air craft characteristics, various surface of an airport, Wind rose diagram, Geometric elements of run way and taxiway , holding apron, parking configuration , terminal building , visual aids, air traffic control, airport marking and lighting.

Reference Books:
1. A text book of railway engineering , By S.C.Saxena and M.G.Arora
2. Air-port Engineering by S.K.Khanna and M.G.Arora
3. Railway Engineering by Satish Chandra & MM Agrawal, Oxford University Press.

PECI5305 PAVEMENT DESIGN (3-0-0)

Module – I
Introduction: Classification of pavements, Difference between highway and runway pavements, Factors affecting structural design, Characteristics of traffic loading, Concept of VDF and Computation of design traffic.

Module – II
Principles of pavement design: Concepts of structural and functional failures, Performance criteria; Analysis of pavements: ESWL, Analysis of flexible and concrete pavements.
Design of pavements: IRC, AASHTO and other important methods of design of bituminous and concrete pavements.

Module – III
Pavement evaluation techniques: Benkelman beam, Falling weight deflectometer and other equipments, Concepts of pavement maintenance management.

Reference Books:
1. Principles of Pavement Design, E. J. Yoder & M.W. Witzack, John Wiley and Sons, New York.
2. Principles of Transportation Engineering, P. Chakroborty & A. Das, PHI Publication.
3. Pavement Analysis and Design, Y. H. Huang, Prentice Hall

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

1. A. Ravindran, D. T. Philips, J. Solberg, *" Operations Research- Principle and Practice*", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " *Optimization for Engineering Design*", PHI Learning Pvt Ltd

Recommended Reference books:

1. **S**tephen G. Nash, A. Sofer, *" Linear and Non-linear Programming*", McGraw Hill
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis," *Engineering Optimization*", Second edition, Wiley India Pvt. Ltd
3. H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, "*Operations Research*", Eighth Edition, Pearson Education
4. F.S.Hiller, G.J.Lieberman, *" Operations Research*", Eighth Edition, Tata McDraw Hill
5. P.K.Gupta, D.S.Hira, "*Operations Research*", S.Chand and Company Ltd.

PEME5308 NON-CONVENTIONAL ENERGY SOURCES
(3-0-0)

Module I   **(10 Classes)**

Energy, Ecology and environment: Introduction, Classification of Energy Resources, Common Forms of Energy, Energy Chain, Advantages and Disadvantages of Conventional Energy Sources, Importance and Salient Features of Non-Conventional Energy Sources, Environmental and ecological Aspects of Energy use, Environment-Economy-Energy and Sustainable Development, World Energy Status, Energy Scenario in India.

Energy Conservation and Energy Storage: Salient Features of "Energy Conservation Act, 2001", Various Aspects of Energy Conservation, Principles of Energy Conservation, General Electrical ECO's (Energy Conservation Opportunities),

Solar Energy: Basics, The Sun as a Source of Energy, Sun, Earth Radiation Spectrums, Extraterrestrial and Terrestrial Radiations, Spectral Energy Distribution of Solar Radiation, Depletion of Solar Radiation, Measurements of Solar Radiation, Solar Time (Local Apparent Time), Solar Radiation Geometry, Solar Day Length, Empirical Equations for Estimating Solar Radiation(Hourly Global, Diffuse and Beam Radiations) on Horizontal Surface Under Cloudless and Cloudy Skies, Solar Radiation on Inclined Plane Surface only (empirical relations for numerical)

Module II   **(15 Classes)**

Solar Thermal Systems: Solar Collectors: Flat plate and concentric collectors, Solar Water Heater, Solar Passive Space - Heating and Cooling Systems, Solar Refrigeration and Air-Conditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryer, Solar Distillation (or Desalination of Water),

Solar Photovoltaic Systems: Solar Cell Fundamentals, Solar Cell Characteristics, Solar Cell Classification, Solar Cell, Module, Panel and Array Construction, Solar PV Systems, Solar PV Applications.

Wind Energy: Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of Wind Power, Wind Turbine Types and Their Construction, Wind Energy Conversion Systems (WECS), Effects of Wind Speed and Grid Condition (System Integration),

Module III   **(15 Classes)**

Biomass Energy: Photosynthesis Process, Usable Forms of Biomass, their Composition and Fuel Properties, Biomass Resources , Biomass Conversion Technologies, Urban Waste to Energy Conversion, Biomass Gasification ,Biomass Liquefaction, Biomass to Ethanol Production, Biogas Production from Waste Biomass, Energy Farming.

Miscellaneous Non-conventional Technologies

Geothermal Energy: Applications, Origin and Distribution of Geothermal Energy, Types of Geothermal Resource.

Ocean Energy: Tidal Energy, Wave Energy, Ocean Thermal Energy

Fuel Cell Technology: Types, Principle of operation, Advantages and disadvantages.

<u>**Text Book:**</u>
1. Non Conventional Energy Sources: B.M Khan, TMH Publications
2. Renewable Energy Sources and Emerging Technology: D.P.Kothari and etal., PHI
3. Renewable Energy Sources & Conversion Technology: N.K.Bansal, Manfred Kleenman & Michael Meliss, TMH Publication.

Reference:
1. Renewable Energy Sources:Fundamentals & Applications:G.N.Tiwari & M.K.Ghosal, Narosa Pub
2. Non Conventional Energy Resources: D.S. Chauhan and S.K.Srivastava, New Age International
3. Non Conventional Energy Sources: H.P.Garg
4. Non-Conventional Energy Systems: G.D.Rai, Khanna publications
5. Solar Energy Technology: Sukhatme and Nayak, TMH
6. Renewable Energy, Godfrey Boyle, Oxford University Press

PEIT5301 **E-COMMERCE** (3-0-0)

Module –I (Lecture Hour 11)
Basics of E-commerce
Basic Elements, of e-commerce, e-commerce framework, basic infrastructure for e-commerce: Technical, capital, media, Human Resource, Public policy
Technical Infrastructure
Internet connectivity, protocols, web server, software for web server, e-commerce software, security threats to e-commerce, protecting e-commerce system

Module –II (Lecture Hour 12)
Payment System for E-commerce
Online payments system, pre-paid and post-paid electronic payment systems, Electronic data interchange (EDI)
Business Models for E-commerce
Revenue Model, Business model based on strategies, Marketing on the web: Internet based Advertisement, Website usability, consumer oriented e-commerce

Module –III (Lecture Hour 12)
Internet Business Strategies
Electronic marketplaces, Electronic Auctions, Mobile Commerce, Virtual Communities

Textbooks
1. Ecommerce, Gary P. Schneider, Cengage Learning

2. Electronic Commerce: Framework Technologies & Applications, Bharat Bhasker, TMH

Reference Books
1. Electronic Commerce: A Manager's Guide, Kalakota & Whinston, Pearson
2. E-commerce, Jibitesh Mishra, Macmillan
3. E-commerce: Concepts, models & strategies, C.V.S Murthy, Himalaya Publishing

ENVIRONMENTAL ENGINEERING LAB (0-0-3)

A. Water Quality Analysis

1. Determination of pH (Electrometric and Colorimetric).

2. Determination of turbidity by using Nephelometer.

3. Determination of alkalinity and acidity.

4. Optimum dose of coagulants by jar test.

5. Total Hardness.

6. Total solids and suspended solids.

7. Residual chlorine.

8. Chlorides.

9. Chemical Oxygen Demand.

10. Biochemical Oxygen Demand.

11. Dissolved Oxygen.

B. Ambient Air Quality Analysis

12. Respirable Particulate Matter (PM10).

13. Total Suspended Particulate matter (TSP).

14. Determination of SO2 in ambient air.

15. Determination of NOx in ambient air.

C. Noise Pollution measurement

16. Indoor and ambient noise level analysis

D. Microbiological Analysis of Water

17. Microbiological culture analysis of bacterial samples

18. MPN Test

Laboratory Manual:

1. Geotechncial Engineering Laboratory Manual.

2. Environmental Engineering Laboratory Manual.

3. Standard Methods for the Examination of Water and Wastewater- AWWA, APHA, WEF, (USA), 20th edition, 2001.

TRANSPORTATION ENGINEERING LAB (0-0-3)

1. Determination of aggregate crushing value.

2. Determination of Los Angeles abrasion value of aggregates.

3. Determination of aggregate impact value.

4. Determination of penetration value of bitumen.

5. Determination of softening point value of bitumen.

6. Determination of ductility value of bitumen.

7. Determination of flash and fire point of bitumen.

8. Determination of specific gravity of bitumen.

9. Determination of stripping value of aggregate.

10. Determination of flakiness index and elongation index of coarse aggregate.

11. Determination of specific gravity and water absorption of coarse aggregate.

 12. Determination of CBR of soil subgrade

13. Design of GSB and WMM

14. Marshall method of mix design

15. Demonstration of advanced equipments for characterization of pavement materials.

DESIGN & DETAILING OF STEEL STRUCTURES (0-0-3)

1. Design and detailing of steel roof trusses/ industrial buildings

2. Design of columns(with lacing and battening) and column bases

3. Design of plate girders

4.   Detailing of structural steel connections, seated and framed connections

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BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA
CIVIL ENGINEEERING

7th SEMESTER				8TH SEMESTER		
THEORY	CONTACT HOUR	CREDIT		THEORY	CONTACT HOUR	CREDIT
PCCI4401 Foundation Engineering	3-0-0	3		1.**PE-VI(any one)** 3-0-0 3		
PCCI4402 Water Supply & Sanitary Engg	3-0-0	3		PECI5407 Structural Dynamics & Earthquake Engineering		
				PECI5408 Construction Equipments, Planning & Management		
3.**PE-III(any one)**	3-0-0	3		PECI5409 Water Resources Management		
PECI5401 Water Resources Engineering				PECI5410 Traffic Engineering & Transportation Planning		
PECI5402 Ground Water Hydrology				2. **PE-VII(any one)** 3-0- 0 3		
				PECI5411 Ground Improvement Technique		
4. **PE-IV (any one)**	3-0-0	3		PECI5412 Advanced Foundation Engineering		
PECI5403 Design of Advanced Concrete Structures				PECI5413 Soil Dynamics and Earthquake Engineering		
PECI5404 Composite material and Structures				PECI5414 Soil Structure Interaction		
5.**PE-V(any one)**	3-0-0	3		3. **PE-VIII (any one)** 3-0-0 3		
PECI5405 Estimation, Costing & Professional Practice				PECI5415 Prestressed Concrete		
PECI5406 Bridge Engineering				PECI5416 Finite Element Method of Analysis		
				PECI5417 Performance & Evaluation of Pavements		
				PECI5418 Town Planning		
6.**FE-IV(any one)**	3-0-0	3		4.**FE-V(any one)** 3-0-0 3		
HSSM3401 Entrepreneurship Development				HSSM3403 Marketing Management		
PEME5408 Composite Materials				PCME4404 Production & Operation Management		
PCCS4401 Computer Graphics				PETX5412 Management Information System		
PECS5401 Artificial Intelligence				FECE6405 Internet Technology & Applications		
TOTAL		**18**				
				TOTAL		**12**
LAB/SESSIONAL				LAB/SESSIONAL		
PECS7401 Design of Irrigation Structures	0-0-3	2		PCCI7404 Major Project		6
PCCI7402 Design of Water Supply and Sanitary Engineering System	0-0-3	2		PCCI7406 Viva-voce		3
PCCI7403 Minor Project		4		PCCI7405 Seminar		2
				TOTAL		11
		8				
TOTAL		26		TOTAL		23

FOUNDATION ENGINEERING (3-0-0)

Module:I

Lateral Earth Pressure and Retaining Structures: Concept of earth pressure, Earth pressure at rest, active and passive earth pressure for both cohesionless and cohesive soils, Earth pressure theories: Rankine's theory, Coumb's Wedge theory, Graphical methods: Rebhan's and Culmann's graphical solutions, Stability conditions for retaining walls.

Bearing Capacity: Definitions, Rankine's analysis, Types of failures: General and local shear failure, Terzaghi's Analysis, Brinch-Hansen analysis, Meyerhof's analysis, Vesics's bearing capacity equation, Effect of water table on bearing capacity, IS code method for computing bearing capacity, Field Methods: Plate load test and its limitations, Standard penetration test.

Module: II

Shallow Foundations: Types of foundations: Spread footing, combined and strap footing, mat or raft footing, Settlement of footings.

Deep Foundations: Difference between shallow and deep foundations, Types of deep foundations. Pile Foundations: Types of piles, pile driving, load carrying capacity of piles- static and dynamic formulae, Pile load test and its limitations, correlation with penetration tests, Group action in piles- settlement and efficiency of pile groups in clay, negative skin friction, Under reamed pile foundation. Basics of well foundation - types, component parts and ideas about the forces acting on a well foundation.

Module: III

Subsoil Exploration: Necessity and planning for subsoil exploration, Methods - direct (test pits and trenches), indirect (sounding, penetration tests and geophysical methods).
Soil sampling – types of samples, standard penetration test, static and dynamic cone penetration test, in-situ vane shear test, Rock coring, soil exploration report.

Rock Mechanics: Introduction, problems, defects in rock mass, joints, faults, folds, methods of geophysical prospecting, seismic and electrical method.

Reference Books:
1. Principles of Foundation Engineering by B. M. Das, Thomson/Cole, Cenage Learning
2. Geotechnical Engineering by S. K. Gulati & Monoj Gupta, Mc Graw Hill
3. Soil Mechanics and Foundations by Dr B. C. Punmia et al., Laxmi Publications (P) Ltd, New Delhi
4. Rock Mechanics for Engineers by B. P. Verma, Khanna Publishers
5. Geotechnical Engineering by C. Venkatramiah, New Age International Publishers, New Delhi
6. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New Age International Publishers, New Delhi
7. Geotechnical Engineering by K L Arora

WATER SUPPLY AND SANITARY ENGINEERING

Module – I
General requirement for water supply, sources, quality of water, intake, pumping and transportation of water. Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases, natural purification of water sources.

Module – II
Engineered systems for water treatment : aeration, sedimentation, softening coagulation, filtration, adsorption, ion exchange, and disinfection. Water distribution system.

Generation and collection of waste water, sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water, design of sewerage system
Primary, secondary and tertiary treatment of wastewater. Waste water disposal standards,

Module – III
Basic of microbiology. Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications, trickling filter, RBC, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors, Sludge digestion and handling, Disposal of effluent and sludge, Design problems on water distribution, sewerage, water treatment units, wastewater treatment units and sludge digestion.

Reference Books:
1. Water Supply and Sanitary Engineering by B.S.Birdi
2. Public health engineering by S.K.Duggal
3. Water Supply and Sewerage, E.W. Steel
4. Textbook of Water Supply Engineering, S.R. Kshira sagar
5. Sewerage and Sewage Treatment, S.R. Kshira sagar

WATER RESOURCES ENGINEERING (3-0-0)

Module-I

Precipitation, its Measurement and Analysis: Hydrologic cycle, catchment area and watershed, Rainfall and its characteristics, Rain gauges, Non-Recording and Recording type, Average rainfall over a catchment, Evapo-transpiration, Pan evaporation, Pan coefficient, Infiltration, W-Index and   -Index.

Discharge Measurement: Stream gauging, Flow rating curve, Use of current meters for velocity measurement, Dye-dilution method of discharge measurement, Estimation of discharge.

Module-II

Hydrograph: Characteristics of a Run off hydrograph, Unit hydrograph, S-hydrograph, Instantaneous Unit hydrograph, Synthetic Unit hydrograph, Duration Curve, Mass flow hydrograph.

Flood Control: Flood flows, Frequency studies, Statistical analysis for flood prediction, Method of flood control, Flood routing, Reservoir routing and Channel routing, River training works

Module-III

Open Channel Flow: Definition, Uniform flow, Chezy's Kutter's equation, Most economical section, specific energy, critical, subcritical, supercritical flow, Non-uniform flow, Gradual varied flow, Hydraulic jump,

Dock and Harbours: Natural and artificial harbours, Selection of site, study of winds, tides and wave actions, Accretion and denudation, Principle of construction of Breakwaters, Quays and jetties, Dry, Wet and Floating Docks.

Reference Books:
1. Engg. Hydrology by K. Subramanian Tata-McGraw-Hill
2. Hydrology and Water Resources Engineering by K. C. Patra, Narosa Publishing House, New Delhi
3. Dock and Harbours by Srinivasan
4. Hydrology by H.M. Raghunath, New age Int. Publication, New Delhi
5. Hydrology by P.J.R. Reddy, University Science Press, New Delhi

GROUND WATER HYDROLOGY (3-0-0)

Module I

Hydrologic cycle, Water balance, Occurrence of ground water: Origin, geological formations as aquifers, type of aquifers, groundwater basins, springs. Darcy's Law, validity of Darcy's Law permeability, laboratory and field measurement of permeability, groundwater Flow lines. Steady flow to a well, steady radial flow to a well in confined aquifer and unconfined aquifer, Unsteady radial flow into a confined aquifer, Non equilibrium Theis equation, Theis method of solution, multiple well system.

Module II

Methods of constructions of deep and shallow wells: The percussion (or cable tool) method of drilling, Direct circulation hydraulic rotary method, Down the hole hammer method, well logs-receptivity logging, testing of wells for yield, Effect of irrigation, stream flow, rainfall on groundwater fluctuations, seasonal and secular variations, fluctuation due to miscellaneous causes.

Surface and Subsurface investigations of groundwater: Geophysical exploration, Electrical resistivity method, aerial photo interpretation, remote sensing applications to ground water exploration, test drilling, Artificial recharge by water spreading, through pits and shaft, recharge through other methods;

Module III

Ground water pollution: Municipal sources, liquid wastes from domestic uses, solid wastes, Industrial sources, tank and pipeline leakage, Mining activity, agricultural sources, septic tank and cesspools, saline water intrusion in coastal aquifers, methods to control saline water intrusion ; Groundwater management: Concepts of Basin management, Equation of hydrologic equilibrium, groundwater basin investigations, conjunctive use of surface and groundwater.

Reference Books:
1. Groundwater Hydrology, D. K. Todd, John Wiley and Sons.
2. Ground Water, H. M. Raghunath,.
3. Groundwater and Tube Wells, S. P. Garg, Oxford and IBH Publishing Co., New Delhi.

DESIGN OF ADVANCED CONCRETE STRUCTURES (3-0-0)
(Relevant IS Codes are permitted for use in the University Examination)

Module I

Introduction to earthquake design and detailing, cyclic behaviour of concrete and reinforcement, significance of ductility, design and detailing for ductility, codal provisions, simple problems based on above concept, computation of earthquake forces on building frames using seismic coefficient method as per IS 1893-2002

Module II

Retaining walls, various forces acting on retaining wall, stability requirement, design of cantilever and counterfort retaining walls,
Design of water tanks, design requirements, design of tanks on ground, under ground and elevated water tanks.

Module III

Introduction to Prestressed concrete: Prestressing system, Pre-tensioning and post-tensioning systems, materials and codes, need for high strength steel and concrete, basic concepts, losses of prestress, analysis of beams under prestress and bending stresses.

Types of bridges, components , various types of loads and forces acting on bridges, types of IRC loading, Design of slab culverts

Reference Books
1. Limit State Design-A.K.Jain, Nemchand & Bros, Roorkee
2. Advanced RCC Design-P.C.Verghese, PHI
3. Earthquake Resistant Design of Structures, Shrikhande and Agrawal, PHI
4. Prestressed Concrete- N.Krishnaraju, TMH
5. RCC Design-B.C.Punmia,A.K.Jain & A.K Jain-Laxmi Publications

. COMPOSITE MATERIALS AND STRUCTURES (3-0-0)

Module I:

Introduction: definition and characteristics, fibres, matrices, fibre reinforced composites, advantages and limitations, basic concepts and characteristics: isotropy, orthotropy, classification, lamina and laminate, micromechanics and macromechanics, constituent materials and properties.

Elastic behaviour of unidirectional lamina: specially orthotropic and transversely isotropic material, relation between mathematical and engineering constants, stress strain relations for thin lamina, transformation of stress and strain, transformation of elastic parameters, transformation of stress-strain relations in terms of engineering constants.

Module II:

Elastic behaviour of multidirectional laminates, symmetric and balanced laminates, design considerations, computational procedure for finding engineering elastic properties, stress and failure analysis of multidirectional laminates.

Module III:

Bending of laminated composite plates, thin laminated plate theory, deflection of all edges simply supported rectangular symmetric cross-ply laminate, two opposite edges simply supported.

Books:
1. I.M. Daniel & O. Ishai,"Engineering Mechanics of Composite Materials"
2. Composite Structures by Madhujit Mukhopadhyay-Oxford University Press
3. S.W.Tsai & H.T.Hahn, "Introduction to Composite Materials: Technomic Pub. Co.INC, USA

ESTIMATION, COSTING AND PROFESSIONAL PRACTICE (3-0-0)

Module – I
Quality estimation:
Principles of estimation, methods and units, Estimation of materials in buildings, Culverts and bridges.
Module II
Principles of general and detailed specification for various types building works.

Analysis of rates, description, Prime cost, Schedule rates, Analysis of rates for various types of works.
Module – III
Network techniques, Introduction to CPM/ PERT methods and their use in project planning construction schedules for jobs, materials equipments, labour and finance.
Reference Books:
1. Estimating and Costing in Civil Engineering Theory & Practice, B.N. Dutta, UBS Publishers
2. PERT and CPM, L.S. Sreenath, East West Press
3. Civil engineering contracts and estimates by B.S. Patil, University Press.

BRIDGE ENGINEERING (3-0-0)

Module I
Introduction, historical review, engineering and aesthetic requirements in bridge design. Introduction to bridge codes. Economic evaluation of a bridge project. Site investigation and planning. Bridge hydrology, economic span, Scour - factors affecting the scour and evaluation of scour .
Module II
Standards for loadings for bridge design. IRC loadings, Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures; Superstructure - right, skew and curved slabs. Girder bridges - types, load distribution, Orthotropic plate analysis of bridge decks, solution of typical problems using Courbon's method of analysis
Module III
Introduction to long span bridges - cantilever, arch, cable stayed and suspension bridges. Methods of construction of R.C Bridges, Prestressed concrete bridges and steel bridges Fabrication, Lounching & creation. construction joints (use of relevant codes of practice are permitted in the examination).
Reference Books:
1. Bridge Engineering – Victor Jognson, TMH Publication
2. Principles and practice of Bridge engineering by S.P Bindra, Dhanapat rai publ
3.V. K. Raina, *Concrete Bridges Practice – Analysis, Design and Economics*, Shroff Pub, New Delhi 2nd Ed. 2005.
4. Design of Concrete Bridges, Vazirani, Ratwani and Aswani, Khanna Pub. 2nd Ed.
5. B. M. Das, *Principles of Foundation Engineering,* Thomson, Indian Edition, 2003.
Reference Codes:
1. IRC codes for Road bridges- IRS Sec –I , II, III
2. IRS Codes of Practice for Railway bridges.

ENTREPRENEURSHIP DEVELOPMENT

Module I: **Understanding Entrepreneurship** **10Hrs**

Concept of Entrepreneurship, Motivation for Economic Development and Entrepreneurial Achievement, Enterprise and Society

Why and how to start Business – Entrepreneurial traits and skills, Mind Vrs Money in Commencing New Ventures, Entrepreneurial success and failures, Environmental dynamics and change.

Entrepreneurial Process

Step by step approach to entrepreneurial start up

Decision for Entrepreneurial start up.

Module II: **Setting up of a small Business Enterprise.** **10Hrs**

Identifying the Business opportunity - Business opportunities in various sectors, formalities for setting up small enterprises in manufacturing and services, Environmental pollution and allied regulatory and non-regulatory clearances for new venture promotion in SME sector.

Writing a Business plan, components of a B-Plan, determining Bankability of the project.

Module III: **Institutional Support for SME.** **10Hrs**

Central / State level Institution promoting SME.

Financial Management in small business.

Marketing Management, problems & strategies

Problems of HRM – Relevant Labour – laws.

Sickness in Small Enterprises.

Causes and symptoms of sickness – cures of sickness.

Govt. policies on revival of sickness and remedial measures.

Reference Books:

1. Entrepreneurship Development, Small Business Enterprises, Chavantimath, Pearson.
2. Entrepreneurial Development, S.S. Khanka, S Chand
3. Entrepreneurship, Barringer BR, Ireland R.D., Pearson
4. Entrepreneurship, David H Holt, PHI
5. Entrepreneurship, Kurilko, D.F. and Attodgets RM, Cengage
6. The Dynamics of Entrepreneurial Development & Management, Vasant Desai, HPH.
7. Entrepreneurship, Roy, Oxford
8. Entrepreneurship, Hisrich, Peters, Shepherd, TMH

COMPOSITE MATERIALS

COMPUTER GRAPHICS

Module – I   **(10 hours)**

Overview of Graphics System: Video Display Units, Raster-Scan and Random Scan Systems, Graphics Input and Output Devices.

Output Primitives: Line drawing Algorithms: DDA and Bresenham's Line Algorithm, Circle drawing Algorithms: Midpoint Circle Algorithm and Bresenham's Circle drawing Algorithm.

Two Dimensional Geometric Transformation: Basic Transformation (Translation, rotation, Scaling) Matrix Representation, Composite Transformations, Reflection, Shear, Transformation between coordinate systems.

Two Dimensional Viewing: Window-to- View port Coordinate Transformation.

Module –II   **(12 hours)**

Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland-Hodgeman Algorithm).

Aliasing and Antialiasing, Half toning, Thresholding and Dithering, Scan conversion of Character.

Polygon Filling: Seed Fill Algorithm, Scan line Algorithm.

Two Dimensional Object Representation: Spline Representation, Bezier Curves and B-Spline Curves.

Fractal Geometry: Fractal Classification and Fractal Dimension.

Three Dimensional Geometric and Modeling Transformations: Translation Rotation, Scaling, Reflections, shear, Composite Transformation.

Projections: Parallel Projection and Perspective Projection.

Module –III   **(8 hours)**

Visible Surface Detection Methods: Back-face Detection, Depth Buffer, A- Buffer, Scan- line Algorithm and Painters Algorithm.

Illumination Models: Basic Models, Displaying Light Intensities.

Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading and Phong Shading.

Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, methods of controlling Animation, Morphing.

Virtual Reality: Types of Virtual reality systems, Input and Output Virtual Reality devices.

Textbook
1. Computer Graphics with Virtual Reality System, Rajesh K.Maurya, Wiley-Dreamtech.
2. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education

Reference Books
1. Computer Graphics Principle and Practice , J.D. Foley, A.Dam, S.K. Feiner, Addison, Wesley
2. Procedural Elements of Computer Graphics- David Rogers (TMH)
3. Computer Graphics: Algorithms and Implementations – D.P Mukherjee & Debasish Jana (PHI)
4. Introduction to Computer Graphics & Multimedia – Anirban Mukhopadhyay & Arup Chattopadhyay (Vikas)

ARTIFICIAL INTELLIGENCE

Module 1   **12Hrs**

What is Artificial Intelligence? AI Technique, Level of the Model,Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis,**Knowledge Representation:** Representations and Mappings, Approaches to Knowledge Representation, **Using Predicate Logic**: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.**Using Rules**: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.**Symbolic Reasoning Under Uncertainty**: Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, Breadth-first Search.**Weak and Strong Slot-and-Filler Structures**: Semantic Nets, Frames, Conceptual DependencyScripts, CYC.

Module 2   **10Hrs**

Game Playing: The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening.**Planning**: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical PlanningOther Planning Techniques.**Understanding**: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.**Natural Language Processing**: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

Module 3   **8Hrs**

Learning: Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning. **Expert Systems**: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Text Book:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009

References:

1) Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2) S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

DESIGN OF IRRIGATION STRUCTURES (0-0-3)

1. Design of different types of dams
2. Design of different types of spillways
3. Design of head regulator and cross head regulator
4. Design of channel
5. Design of cross drainage houses, fall and river training works.

DESIGN OF WATER SUPPLY AND SANITARY ENGINEERING SYSTEM (0-0-3)

1. Design of City water supply system
2. Design of water treatment plant
3. Design of sewerage network
4. Design of sewerage treatment plant

PECI 5407 **STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING** (3-0-0)

Model I:
Single degree of freedom system: Equation of motion, Damped and undamped free vibration, Response to harmonic, periodic, impulse load and general dynamic load, Duhamel's integral;

Model II:
Multi-degrees of freedom system: Equation of motion, Free vibration analysis, Dynamic response and modal analysis.

Free and Forced vibration of distributed mass system: Longitudinal, flexural and torsional vibration of rods, transeverse vibration of beams. Raleigh's principle.

Model III:

Analysis of structural response to Earthquakes: Seismological background, Deterministic analysis of Earthquake.

Essential Reading:

1. Dynamics of Structures: Theory and Applications to Earthquake Engineering, A K Chropra , Prentice Hall of India
2. Theory of Vibration with application, W. T. Thomson.
3. Structural Dynamics, M Mukhopadhyay: Ane Books Pvt Ltd, New Delhi
4. Structural Dynamics - Theory and Computation, M. Paz, Van Nostrand, 1985.
5. Dynamics of structures, W. Clough and J Penzien, McGraw-Hill, Inc,

PECI 5408 CONSTRUCTION EQUIPMENTS, PLANNING & MANAGEMENT (3-0-0)

Module – I
Construction equipments:
Different types of construction equipments, earth moving, dewatering and pumping, grouting, pile driving equipments.
Conveyers, cranes, Concrete mixture, Vibrators, Rollers, Compactors and other raod construction equipments.
Factors affecting selection of construction equipments

Module – II
Equipments management, Productivity, Operational cost, Owning and hiring cost, Work motion study.
Objectives and functions of construction management. Finance and cost accounting, Quality control, safety and safety measures in construction works.

Network techniques, Introduction to CPM/ PERT methods and their use in construction planning. Construction schedules for jobs, materials, equipments, labour and finance.

Module – III

Contract Management:
Legal aspects, contract laws related to land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender operation. Evaluation of tenders, Award of work, Disputes and arbitration.

Reference Books:
1. Construction Planning and management by U.K.Shrivastava, Galgotia publ.
2. Construction Planning and Management, Mehesh Verma
3. PERT & CPM, L.S. Sreenath, East West Press
4. Construction Project management, Theory and Practice, By Jha, Pearson.

PECI 5409 **WATER RESOURCES MANAGEMENT**

Module-I

1. Introduction of the subject.

2. Global and national scenario of water availability.

3. Projected water needs for drinking, agriculture and other uses.

4. River basins of India and inter basin transfer of water, run off and rainfall data of basins.

5. National water policy.

Module-II

6. Water power, its relation with irrigation and other needs.

7. Ground water - its hydrology, conjunctive uses etc. And ground water rules.

8. Storage of water - current storage scenario in india, sedimentation, evaporation and other related problems in the location of storage sites and rehabitation problems, etc.

9. Inter state and inter national level sharing of water.

10. Floods and draughts, drainage, water logging, soil salinity and soil conservation problems.

Module-III

11. Broad principles of hydraulic structures and canal systems.

12. Water related environmental problems.

13. Water pollution, ground water and river pollutions etc.

14. Water conservation measures.

Reference book:

1. Water Resources Systems: Modelling Techniques And Analysis, Vedula And Majumdar, Tata Mcgraw-Hill, New Delhi

PECI 5410 TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING (3-0-0)

Module – I
Organization of traffic engineering department and its importance under Indian conditions. Road user characteristics, Human factors governing road user behaviour, Vehicle characteristics, Slow moving traffic characteristics in Indian conditions.

Module –II
Speed, Journey time and delay surveys, Traffic Volume and Origin-Destination survey, Traffic flow parameters, Speed, density and volume relationships.

Parking types, ill effects of parking, off street parking facilities, Traffic regulations, Traffic management measures.

Module –III
High capacity analysis, Capacity of freeways and express ways in rural areas. Design of rotary intersection and capacity of rotary intersection.

Systems approach to transport planning, Stages in transport planning, Trip generation and distribution, Traffic assignment and modal split, Economic evaluation of transportation plans

Reference Books:
1 Traffic Engineering and Transport Planning, L.R. Kadiyali, Khanna Publishers, New Delhi
2. Transportation Planning, C. S. Papacostas and P. D. Prevedouros, PHI
3. Transportation Engg: An introduction, C. J. Khisty & B. K. Lall, PHI

PECI 5411 **GROUND IMPROVEMENT TECHNIQUES** (3-0-0)

Module – I

Introduction, Necessity of ground improvement, Dewatering, methods, Analysis and design of dewatering systems.

Grouting types, Properties, Method of grouting, Ground selection and control.

Module – II

Compaction, Methods of compaction, Engineering properties of compacted soil, Field compaction and its control.

Module – III

Soil stabilization, Use of chemical additives, Stone columns, Principle, design and method of installation. Reinforced earth, Concept, Materials, Application and design, Use of geo-synthetics and geo-cells in construction work.

Reference Books:

1.Grond improvement techniques by P.P.Raj, Laxmi Publications.

2.Foundation Design and Construction, M.J. Tomlinson

2. Foundation Engineering, G.A. Leonard, Tata McGraw Hill

3. Modern Geotechnical Engineering, Alam Singh, IBT Publishers\

PECI 5412 **ADVANCED FOUNDATION ENGINEERING** (3-0-0)

Module – I

Foundation subjected to Vibration: Introduction, definitions, degrees of freedom, types of machine foundation, single degree of freedom system, free and forced vibration with and without damping. Parameters influencing the design of machine foundations. IS code of practice for the design of various types of machine foundations.
Measurement of dynamic soil parameters: Field and Laboratory tests (low strain and large strain tests, element and model tests)

Module – II

Sheet pile walls: Cantilever and anchored sheet pile walls, methods of analysis, Vertical cuts and ditches, earth pressure analysis.
Coffer dams: Types, description.
Floating foundation: Introduction, types, methods to prevent floatation, necessity of using raft for full floating foundation.

Module – III

Foundations on expansive soil: Shrinkage and expansion of clays, identification of expansive soil, swelling pressure measurement, causes and type of damages in building on expansive clays, structural and environmental solutions, Principles of design of foundation in expansive soil deposits.

Reference Books :

1. Soil Mechanics and Foundations by B. C. Punmia et al., Laxmi Publications (P) Ltd, New Delhi.
2. Foundation Engineering, P.C. Verghese, Prentice Hall of India
3. Textbook of Geotechnical Engineering, I. Q. Khan, Prentice Hall
4. Geotechnical Earthquake Engineering by *Steven L. Kramer*, Low Price Edition, Pearson Education, www.pearsoned.co.in
5. Soil Dynamics by *Shamsher Prakash*, McGraw-Hill Book Company
6. Geotechnical Engineering by Donald P. Cudoto, Pearson Education, Prentice Hall

PECI 5413 SOIL DYNAMICS & EARTHQUAKE ENGINEERING (3-0-0)

MODULE I:
Soil Dynamics: *Introduction*: Soil mechanics and soil dynamics, problems of dynamic loading on soil structure.

Theory of vibrations: Introduction, definitions, properties of simple harmonic motion, free vibrations of spring-mass system, Equations for free and forced vibrations with and without viscous damping (only equations: no solution).

Dynamic Soil Properties: Introduction, measurement of dynamic soil properties (laboratory and field tests - Stress and strain controlled cyclic tri-axial test, seismic reflection and refraction test, seismic up-hole/down hole test, dilatometer and pressure meter tests, seismic cone penetration test, suspension logging test), stress-strain behaviour of cyclically loaded soils, strength of cyclically loaded soils.

MODULE II:

Introduction to geotechnical earthquake engineering: Background, seismic hazards; ground shaking, structural hazards, liquefaction, landslides, lifeline hazards, tsunami hazards, mitigation of seismic hazards, significant historical earthquakes.

Seismology and earthquakes: Internal structure of the earth, continental drift and plate tectonics, faults, elastic rebound theory, other sources of seismic activity location of earthquakes, size of earthquakes (intensity, magnitude and energy).

Seismic Bearing Capacity Analysis: Introduction, punching shear failure approach for cohesive and cohesion-less soils, Terzaghi's method for both cohesion-less and cohesive soils.

MODULE III:

Liquefaction: Introduction, Flow liquefaction and cyclic mobility, liquefaction susceptibility (historical, geologic, and compositional). Initiation of liquefaction due to excess pore water pressure, effects of liquefaction (alteration of ground motion, development of sand boils, settlement and instability).

Ground Improvement Techniques for Remediation of seismic hazards: Introduction, densification techniques (Vibro-technique, dynamic compaction, blasting, grouting and mixing techniques).

Reference Books:
1. Geotechnical Earthquake Engineering by **Steven L. Kramer**, Low Price Edition, Pearson Education, www.pearsoned.co.in
2. Soil Dynamics by **Shamsher Prakash**, McGraw-Hill Book Company
3. Soil Behaviour in Earthquake Geotechnics by **Kenji Ishihar**a, Clarendon Press, Oxford
4. Theory of Vibrations with Applications by **W. T. Thomson** and **M. D. Dahleh**, Low Price Edition, Pearson Education, www.pearsoned.co.in

PECI 5414 **SOIL STRUCTURE INTERACTION** (3-0-0)

Module I
Soil-Foundation Interaction: Introduction to soil-foundation interaction problems, Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour.

Module II
Beam on Elastic Foundation- Soil Models: Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness. Plate on Elastic Medium: Thin and thick plates, Analysis of finite plates, Numerical analysis of finite plates, simple solutions.

Module III
Elastic Analysis of Pile: Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap. ; Laterally Loaded Pile: Load deflection prediction for laterally loaded piles, Sub grade reaction and elastic analysis, Interaction analysis, Pile-raft system, Solutions through influence charts.

Reference Books:

1. Pile Foundation Analysis and Design, H. G. Poulos and E. H. Davis, John Wiley, 1980.
2. Analysis of Beams on Elastic foundation, G. Jones, Thomas Telford, 1997.
3. Single piles and pile groups under lateral loading, L. C. Reese, Taylor & Francis, 2000.

PECI 5415 **PRESTRESSED CONCRETE (3-0-0)**

Module I
Prestressing system, materials and codes: Basic concept, Losses of prestress, analysis of prestress and bending stresses. Need for high strength steel and concrete. Advantages and applications.
Pre-tensioning and post tensioning systems.

Module – II
Design of beams : Analysis and design of section for bending and shear,pressureline, concept of load balancing, cracking moment, bending of cables, limit state analysis and design, anchorage zone stresses, design of end block, Application to bridges.
Selection of prestress concrete members, short term and long term deflections of uncracked members.

Module –III
Flexural strength of prestresed concrete sections
Continuous beams, Design concept concordancy of cables, Secondary design consideration. Design pre-tensioned and post tensioned beam

Reference Books:
1. Prestressed Concrete, Raju,N.K., Tata McGraw Hill
2. Prestressed Concrete, T. Y. Lin

PECI 5416 **FINITE ELEMENT METHOD OF ANALYSIS** (3-0-0)

Introduction: The Continuum, Equations of Equilibrium, Boundary Conditions, Strain displacement relations, Stress strain Relations, Plane stress and plane Strain problems, Different methods of structural analysis including numerical methods. Basics of finite element method (FEM), different steps involved in FEM, Different approaches of FEM, Direct method, Energy approach, Weighted residual Method.

One and Two Dimensional Problems: Detail formulation including shape functions. stress strain relations, strain displacement relations and derivation of stiffness matrices using energy approach, Assembling of element matrices, application of displacement boundary conditions, Numerical solution of one dimensional problems using bar, truss, beam elements and frames. Derivation of shape function using Lagrange's interpolation, Pascal's triangle, Convergence criteria. Finite Element modeling of two dimensional problems using Constant strain Triangle(CST) elements, Stress strain relations for isotropic and orthotropic materials, Four nodded rectangular elements, axisymmetric solids subjected to axisymmetric loading.

Isoparametric Elements: Natural coordinates, isoparametric elements, four node, eight node elements. Numerical integration, order of integration.

Plate Bending: Bending of plates, rectangular elements, triangular elements and quadrilateral elements, Concept of 3D modeling.

Essential Reading

1. C. S. Krishnamoorthy, Finite Element analysis-Theory and Programming, TMH
2. R. D. Cook., Concepts and Applications of Finite Element Analysis , Wiley.
3. M. Mukhopadhyay-Matrix and Finite Element Analysis of Structures
4. O. C Zienkiewicz .and R. L. Taylor, Finite Element Method, Mc Graw Hill
5. Introduction to Finite Elements in Engineering, T.P. Chandrupatla and A.D. Belegundu
6. Finite Element Analysis in Engineering Design, S. Rajasekharan.

PECI 5417 PERFORMANCE AND EVALUATION OF PAVEMENTS
(3-0-0)

Module – I

Factors affecting pavement performances, Failure and distress- their nature, Evaluation techniques for monitoring the nature and magnitude of distress in flexible and rigid pavements, Devices adopted.

Module – II

Measurement of profile, tolerance standards in quality control, waves and deformations, Measurement of rebound deflection, roughness index, Effect of traffic, fuel, chemicals and environmental conditions.

Module – III

Assessing structural strength of highway and airport pavements, Serviceability, Structural number and energy concepts, Need for conditioning and strengthening.

Overlays- their types, general construction features, Design of overlays over existing flexible and rigid pavements, IRC, AASHTO and British methods, their comparison, Economics of overlays.

Reference Books

1. Principles of Pavement Design, E. J. Yoder & M.W. Witzack, John Wiley and Sons, New York.
2. Pavement Analysis and Design, Y. H. Huang, Prentice Hall

PECI 5418 TOWN PLANNING (3-0-0)

Module – I

Principles of architectural design –primary elements, form, space, organization, circulation, proportion and scale, ordering principles.

Functional planning of buildings: Planning, designing and construction, General building requirements, Permit and Inspection (as per the National building Code)

Module – II

Town Planning ; Evolution of towns : History and trends in town planning:-origin and growth, Historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town ; New Concepts in town planning : Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning.

Module – III

Planning Principles, Practice and Techniques: Elements of City plan, Estimating future needs, Planning standards, Zoning:- its definition, procedure and districts, height and bulk zoning, F.A.R., Master Plan; Concepts of urban planning , design and landscaping.

Reference Books:

1. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers.
2. D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley.
3. S. Eisner, A. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design, JohnWiley.

HSSM3403 **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.
Marketing Planning : Exploring Opportunity, Product –market selection, Marketing Planning Process.
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 Segmentation, Targeting and Positioning: Definition, Bases of segmenting consumer and Industrial markets. Target Market strategies: Market Positioning.
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.
Product Planning : Product Life Cycle, New Product Development Process, Branding Strategy, Positioning a Brand, Brand Equity, Packaging and Labeling, Product-mix and Product Line, Planned Obsolescence.

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.
2. Saxena, "Marketing Management" Tata McGraw Hill, 4/e.
Reference
1. Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
2. Karunakaran "Marketing Management", Himalaya Publishing House, 2010/e.
3. Kotler, Keller,Koshy and Jha, "Marketing Management", 13/e, Pearson Education.

PCME4404 **PRODUCTION & OPERATION MANAGEMENT**

Objective : The course aims at acquainting all engineering graduates irrespective of their specializations the basic issues and tools of managing production and operations functions of an organization.

Module I
1. Operations Function in an Organization, Manufacturing Vrs Service Operations, System view of Operations, Strategic Role of Operations, Operations Strategies for Competitive Advantage, Operations Quality and Productivity Focus, Meeting Global Challenges of Production and Operations Imperatives. **(3 Hours)**
2. Designing Products, Services and Processes: New Product Design- Product Life Cycle, Product Development Process, Process Technology : Project, Jobshop, Batch, Assembly Line, Continuous Manufacturing; Process Technology Life Cycle, Process Technology Trends, FMS, CIM, CAD, CAM; Design for Services, Services Process Technology. **(4 Hours)**
3. Work Study: Methods Study- Techniques of Analysis, recording, improvement and standardization; Work Measurement : Work Measurement Principles using Stopwatch Time Study, Predetermined Motion Time Standards and Work Sampling, Standard Time Estimation. **(4 Hours)**

Module II
4. Location and Layout Planning : Factor Influencing Plant and Warehouse Locations, Impact of Location on cost and revenues. Facility Location Procedure and Models : Qualitative Models, Breakeven Analysis, location Model, centroid method.
Layout Planning: Layout Types : Process Layout, Product Layout, Fixed Position Layout Planning, block diagramming, line balancing, computerized layout planning- overview.
Group Technology **(4 Hours)**
5. Forecasting : Principles and Method, Moving Average, weighted Moving Average, Exponential Smoothing, Winter's Method for Seasonal Demand, Forecasting Error. **(4 Hours)**
6. Manufacturing Planning and Control : The Framework and Components : Aggregate Planning, Master Production Scheduling, Rough-cut-Capacity Planning, Material Requirements Planning, Capacity Requirements Planning. **(5 Hours)**

Module III
7. Sequencing and Scheduling : Single Machine Sequencing : Basics and Performance Evaluation Criteria, Methods for Minimizing Mean Flow Time, Parallel Machines : Minimization of Makespan, Flowshop sequencing : 2 and 3 machines cases : Johnson's Rule and Jobshop Scheduling : Priority dispatching Rules. **(3 Hours)**
8. Inventory Control : Relevant Costs, Basic EOQ Model, Model with Quantity discount, Economic Batch Quantity, Periodic and Continuous Review Systems, Safety Stock, Reorder Point and Order Quantity Calculations. ABC Analysis. **(4 Hours)**
9. Modern Trends in Manufacturing : Just in Time (JIT) System : Shop Floor Control By Kanbans, Total Quality Management, Total Productive Maintenance, ISO 9000, Quality Circle, Kaizen, Poka Yoke, Supply Chain Management. **(4 Hours)**

Reference Book:
1. S.N.Chary, "Production and Operations Management", Tata McGraw Hill.
2. R. Paneerselvam, "Production and Operations Management, Prentice Hall of India.
3. Aswathappa & Bhatt – Production & Operations Management, HPH.
4. Gaither & Frazier - Operations Management, Cengage Publication

5. Russell & Taylor - Operations Management, PHI Publication
6. Chase, Aquilanno, Jacob & Agarwal - Operations Management, TMH Publication.
7. E.E. Adam and R.J. Ebert "Production and Operations Management", Prentice Hall of India

PETX5412 MANAGEMENT INFORMATION SYSTEM

Module – I (12 hours)

Overview: Definition of MIS, Data processing and MIS, Characteristics of MIS, Need / importance of MIS in organization, Limitations of MIS; MIS and other disciplines
Data and Information; Characteristics of Information; Types of Information – Operational, Tactical and Strategic information; Managers as Information Processors;
System Approach: MIS as a system, Sub-systems of MIS – Activity sub-systems, Functional sub-system

Decision Making: Decision-making under certainty, risk and uncertainty; Phases of Decision-making Process; Decision Models - Classical Economic Model, Administrative Model; Organizational Decision-making
Planning for development of MIS: Feasibility Analysis – Technical, Economic, Motivational, Schedule and Operational Feasibility; MIS development as a project;

Module – II (12 hours)

Overview of System Life Cycle Models – Waterfall model, Prototyping model and Spiral model
System Analysis and Design (SAD): Purpose, Requirement engineering, Typical content of System Requirement Specification (SRS), System Design – high level design and low level design, Characteristics of good design – coupling and cohesion
Overview of tools used in SAD – Context diagram, Data Flow Diagram (DFD), Data Dictionary, ER diagram, Structure charts, HIPO documentation, Decision Table, Decision Tree, Pseudocode

Module – III (12 hours)

MIS in Organization: MIS in Marketing; Manufacturing; HRM; Accounting and Finance, Enterprise Resource Planning (ERP) System.

Business Intelligence (BI): Role of BI in marketing, finance, human resource, and manufacturing; Overview of DSS, Data Mining and Data Warehouse

Implementation of MIS: Critical Success Factor

Information System Security, Privacy, Social and Ethical issues

Books:

1. Management Information Systems, M Jaiswal & M Mital, Oxford Univ. Press
2. Information Systems for Modern Management, Murdick, Ross & Claggett, PHI
3. Management Information System, Launden & Launden, Pearson
4. Management Information System, James O Brian, TMH
5. Management Information Systems, A K Gupta, Sultan Chand & Sons
6. Management Information System, Jawadekar, McGraw Hill

FECE6405 **INTERNET TECHNOLOGY AND APPLICATIONS**

Module – I (12 Hour)
The Internet and WWW
Understanding the WWW and the Internet, Emergence of Web, Web Servers, Web Browsers, Protocols, Building Web Sites
HTML
Planning for designing Web pages, Model and structure for a Website, Developing Websites, Basic HTML using images links, Lists, Tables and Forms, Frames for designing a good interactive website

Module – II (12 Hour)
JAVA Script
Programming Fundamentals, Statements, Expressions, Operators, Popup Boxes, Control Statements, Try…. Catch Statement, Throw Statement, Objects of Javascript: Date object, array object, Boolean object, math object
CSS
External Style Sheets, Internal Style Sheets, Inline Style, The class selector, div & span tag
DOM
HTML DOM, inner HTML, Dynamic HTML (DHTML), DHTML form, XML DOM

Module – III (12 Hour)
CGI/PERL
Introduction to CGI, Testing & Debugging Perl CGI Script, Using Scalar variables and operators in Perl

Java Applet
Introduction to Java, Writing Java Applets, Life cycle of applet
Textbooks
1. Web Warrior Guide to Web Design Technologies, Don Gosselin, Joel Sklar & others, Cengage Learning

Reference Books

1. Web Programming: Building Internet Applications, Chris Bates, Wiley Dreamtech
2. Programming the World Wide Web, Robert W Sebesta, Pearson
3. Web Technologies, Uttam K Roy, Oxford
4. Web Technology: A developer perspective, Gopalan & Akilandeswari, PHI

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