

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

CIVIL ENGINEERING

| 7 th SEMESTER | | | | 8 TH 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 | | | |
| 3.PE-III(any one) | | 3-0-0 | 3 | PECI5408 Construction Equipments, Planning & Management | | | |
| PECI5401 Water Resources Engineering | | | | PECI5409 Water Resources Management | | | |
| PECI5402 Ground Water Hydrology | | | | PECI5410 Traffic Engineering & Transportation Planning | | | |
| 4. PE-IV (any one) | | 3-0-0 | 3 | 2. PE-VII(any one) | | 3-0-0 | 3 |
| PECI5403 Design of Advanced Concrete Structures | | | | PECI5411 Ground Improvement Technique | | | |
| PECI5404 Composite material and Structures | | | | PECI5412 Advanced Foundation Engineering | | | |
| 5.PE-V(any one) | | 3-0-0 | 3 | PECI5413 Soil Dynamics and Earthquake Engineering | | | |
| PECI5405 Estimation, Costing & Professional Practice | | | | PECI5414 Soil Structure Interaction | | | |
| PECI5406 Bridge Engineering | | | | 3. PE-VIII (any one) | | 3-0-0 | 3 |
| 6.FE-IV(any one) | | 3-0-0 | 3 | PECI5415 Prestressed Concrete | | | |
| HSSM3401 Entrepreneurship Development | | | | PECI5416 Finite Element Method of Analysis | | | |
| PEME5408 Composite Materials | | | | PECI5417 Performance & Evaluation of Pavements | | | |
| PCCS4401 Computer Graphics | | | | PECI5418 Town Planning | | | |
| PECS5401 Artificial Intelligence | | | | 4.FE-V(any one) | | 3-0-0 | 3 |
| | | | | HSSM3403 Marketing Management | | | |
| TOTAL | | | 18 | PCME4404 Production & Operation Management | | | |
| | | | | PETX5412 Management Information System | | | |
| | | | | FECE6405 Internet Technology & Applications | | | |
| | | | | TOTAL | | | 12 |
| LAB/SESSIONAL | | | | LAB/SESSIONAL | | | |
| PECS5401 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 |
| | | 8 | | TOTAL | | | 11 |
| 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, Coulomb'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, Vesic'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 ϕ -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.Vergheze, 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, Lanching & 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 Dependency Scripts, 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 Planning Other 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

SESSIONAL

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

8TH SEMESTER

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 Chopra , 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 road 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 rehabilitation 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 geosynthetics and geo-cells in construction work.

Reference Books:

1. Ground 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

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 Ishihara**, 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, pressure line, 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 prestressed 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 noded 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
