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
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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

PCCl5301 **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 SO_2 in ambient air.
15. Determination of NO_x 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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