RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF CIVIL ENGINEERING

IV B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
PROFESSIONAL ELECTIVE-III								
A0129207	Design and Drawing of Irrigation Structures	2	1	0	3	30	70	100
A0130207	Railways, Docks & Harbor Engineering							
A0131207	Intelligent Transportation System							
A0132207	Ground Improvement Techniques							
PROFESSIONAL ELECTIVE-IV								
A0133207	Estimation, Costing & Valuation	2	1	0	3	30	70	100
A0145207	Pavement Analysis and Design							
A0136207	Rehabilitation of Structures							
A0144207	Advanced Structural Design							
PROFESSIONAL ELECTIVE-V/MOOCs								
A0137207	Industrial Waste and Waste Water Management	2	1	0	3	30	70	100
A0138207	Fire Safety Engineering Design of Structures							
A0140207	Water Resources System Planning and Management							
A0143207	Earthquake Resistant Design							
OPEN ELECTIVE-III/JOB ORIENTED COURSE								
A0141207	Finite Element Methods in Civil Engineering	2	1	0	3	30	70	100
A0142207	Global Warming and Climate change							
A0134207	Disaster Preparedness and Planning Management							
A0135207	Environmental Impact Assessment and Management							
OPEN ELECTIVE-IV/JOB ORIENTED COURSE								
A0139207	Water Shed Management	2	1	0	3	30	70	100
A0146207	Construction Methods & Equipment							
A0147207	Urban Transportation Planning							
A0148207	Traffic Engineering							
SKILL DEVELOPMENT COURSE								
A0149207	Numerical Methods in Civil Engineering	1	2	0	2	30	70	100
HUMANITIES AND SOCIAL SCIENCE								
A0150207	Green Buildings	2	0	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0015203	Universal Human Values	2	0	0	0	0	0	0
A0094207	Comprehensive Viva	0	0	0	1	0	50	50
A0095207	Industrial / Research Internship	0	0	0	3	0	100	100
	Total	**15**	**7**	**0**	**23**	**210**	**640**	**850**

IV B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject Hours/Week					Marks		
		Theory	Tutorial	Lab	Credits	Internal	External	Total
A0096208	Technical Seminar	0	0	0	1	50	0	50
A0097208	Internship in Industry	0	0	0	5	0	100	100
A0098208	Major Project	0	0	0	6	50	100	150
	Total	**0**	**0**	**0**	**12**	**100**	**200**	**300**

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(A0129207) DESIGN AND DRAWING OF IRRIGATION STRUCTURES
(Professional Elective-III)

COURSE OBJECTIVES:
- Irrigation structures plays vital role in controlling and diverting water flows in the canals and reservoirs. In government sectors Engineer's should have complete understanding about various design and drawing specifications of irrigation structures like canal regulator, aqueduct, tank sluice and surplus weir. Whenever the available natural ground slope is steeper than the designed bed slope of the channel, the difference is adjusted by constructing vertical falls or drops in canal bed at suitable intervals. In this coarse student can get the complete knowledge of well-known canal falls, the straight glacis weir and trapezoidal notch fall.

COURSE OUTCOMES:
At the end of the course student is able to:
- Knowledge about various components of Hydraulic structures
- Flood estimation from the catchments and design of the water way of Hydraulic structure
- Design of various components like foundations, piers, walls and abutments
- Physically making the drawing charts of various irrigation structures
- Knowledge of constructional specifications and protection measures like friction blocks etc.

MAPPING OF COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3			-	-	-	-	-		-	-	-	1	1	-
CO2	3	2	3	-	-	-	-	-	3	-	-	-	1	1	-
CO3		2	3	-	-	-	-	-		-	-	-	1	1	-
CO4	3	2		-	-	-	-	-		-	-	-	1	1	-
CO5	3	2	2	-	-	-	-	-		-	-	-	1	1	-
Avg.	3	2	3	-	-	-	-	-	3	-	-	-	1	1	-

Design and drawing of the following irrigation structures.

1. Canal regulator.
2. Trapezoidal notch fall.
3. Surplus weir.
4. Tank sluice with tower head
5. Straight glacis weir.
6. Under Tunnel

NOTE
Final Examination pattern: First question compulsory for 14 marks contains seven 2 marks questions from unit I to VI, Three Eight marks questions from all units &One Thirty-Two marks question from any of six units has to be answered by the student. The duration of examination will be four hours.

TEXT BOOKS:
1. Design of minor irrigation and canal structures C.Satyanarayana Murthy, Wiley eastern Ltd, 2020.
2. Irrigation engineering and Hydraulic structures S.K.Garg, Standard Book House, 2020.

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(A0130207) RAILWAYS, DOCKS & HARBOUR ENGINEERING
(Professional Elective-III)

Pre-requisites: Transportation Engineering.

COURSE OBJECTIVES:

- The course objective covers the Railway Track Alignment, geometric design of railway track, stations and yards, Tunnelling, Introduction of Harbour Engineering

COURSE OUTCOMES:

At the end of the course student is able to

- Students could learn about the various components involved in planning, design, construction and operation of railways and waterways.
- In case of railways the need of tunnel sand their late surveys, operation and construction is covered.
- Pros and cons of railways and waterways in terms of construction, operations, maintenance and economics are learnt.
- Urban rail transportation as mass transportation facility is studied a part from the vital role played by harbour structure for the import and export of goods.

MAPPING OFCOs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1									-	2	2
CO2	3	2	2	1									-	2	-
CO3	1	2	2	2									-	2	-
CO4	-	2	1	2									-	2	1

UNIT-I INTRODUCTION TO RAILWAY ENGINEERING

Introduction-Importance of Railways in National Development-Factors Controlling alignment-Engineering Surveys for Track Alignment-Railway Track (Permanent Way)-Components and Functions

UNIT-II GEOMETRIC DESIGN OF RAILWAY TRACK

Gradients – Grade Compensation – Cant and Negative Super elevation – Cant Deficiency– Degree of Curve–Crossings and Turnouts.

UNIT-III STATIONS AND YARDS

Introduction-purposes of a rail way station–selection of a site for a railway station– types of railway station, Plat Forms – Definition of a yard – types of yards – level crossing— signalling systems and inter locking –staff quarters– goods traffic at way side stations.

UNIT-IV TUNNELLING

Definition – types of tunnelling – Drainage in tunnels – ventilation of tunnels – lining of tunnels– underground railways–tube railways –maintenance of railway tunnels

UNIT-V HISTORICAL DEVELOPMENT OF PORTS HARBOURS AND DOCKS

Introduction – Early Period of travellers – Mediterranean Harbours – Cretan Harbours – Phasor Harbours Phoenician Harbours – Greek harbours – Roman Harbours – Eighteenth Century Harbours – Slipways and Dry Docks – Dredging Machines –Historical Development of Bombay Port.

UNIT-VI HARBOURS, DOCKS AND BREAK WATER

Introduction – Natural Harbours – Artificial Harbours – Size of Harbours – Open Berths – Docks Shape of Docks and Basins – Design and Construction of Basin or Dock Walls – Dock

Entrances and Entrance Locks – Classification of Breakwaters – Upright Wall Breakwater – Mound with Super structure Water Breaker–Mound Breakwaters.

TEXT BOOKS

1. Railway Engineering by Rangwala Chrotar Publisihing House, Anand, 2021
2. Railway Engineering – A text book Transportation Engineering by S.P.Chandola, S.Chand and Co. Ltd, 2020.

REFERENCEBOOKS

1. Docks and Harbour Engineering – Textbook of Transport Engineering Vol.II by. N.Vaziraniand, S.P.Chandola, Khanna Publishers, NewDelhi, 2020.
2. Railway Engineering by Chandra and Agrawal, Oxford Publishers, New Delhi, 2020.

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(A0131207) INTELLIGENT TRANSPORTATION SYSTEM
(Professional Elective-III)

COURSE OBJECTIVES:
- Impart knowledge on advanced transportation concepts in the field of ITS
- Introduce the technologies of ITS in solving transportation problems

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand the sensor technologies
- Understand the communication techniques
- Apply the various ITS methodologies
- Understand the User Needs
- Define the significance of ITS under Indian conditions

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	3									2	
CO2	2	2	2	1	3									2	
CO3	2	2	2	1	3									2	
CO4	2	2	2	1	3									2	
C05	2	2	2	1	3									2	

UNIT I
Introduction: Objectives- Advantages - Data Collection Techniques - Detectors – Automatic Vehicle Location - Automatic Vehicle Identification - Geographical Information Systems - Video Data Collection.

UNIT II
Telecommunications in ITS: Importance of telecommunications in the ITS system - Information Management - Traffic Management Centers (TMC) - Vehicle–Road side communication – Vehicle Positioning System.

UNIT III
***ITS functional areas*:** Advanced Traffic Management Systems (ATMS) - Advanced Traveler Information Systems (ATIS) - Commercial Vehicle Operations (CVO) - Advanced Vehicle Control Systems (AVCS) - Advanced Public Transportation Systems (APTS) - Advanced Rural Transportation Systems (ARTS).

UNIT IV
ITS User Needs and Services: Travel and Traffic management - Public Transportation Management - Electronic Payment - Commercial Vehicle Operations – Emergency Management - Advanced Vehicle safety systems - Information Management.

UNIT V
Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems - ITS Programs in the World – Overview of ITS implementations in developed countries - Case studies

UNIT VI
ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing

TEXT BOOK:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC), Kan Paul
2. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007 (CDROM).

REFERENCE BOOKS:

1. Chowdhary, M.A. and A Sadek, Fundamentals of Intelligent Transportation systems planning, Artech House Inc., US, 2003.
2. Lawrence A. Klein, Sensor technologies and Data requirements of ITS

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(A0132207) GROUND IMPROVEMENT TECHNIQUES
(Professional Elective-III)

COURSE OUTCOMES:

- To recognize the importance of ground improvement methods. And, to understand the concept and principles of mechanical and hydraulic modification of problematic soils.
- Understand the concepts of physically and chemically treated, grouting technique, and thermal modification methods of soil.
- Impart the knowledge of soil-reinforcement techniques and geosynthetics for construction of civil engineering structures. Analyze, select & design the soil reinforcement based on the problem
- To know the problems associated with expansive soils in construction, their determination through laboratory studies, and potential improvement methods based on field condition.

MAPPING OF COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1		1	1	1	1	1	2	2	2
CO2	3	2			1	1		1	1	1		1	2	2	2
CO3	3	2	2	1		1	1	1	1		1			2	2
CO4	3	2	1		1	1	1		1	1	1	1		2	2

UNIT-I

INTRODUCTION: Typical situations where ground improvement becomes necessary, historical review of methods adopted in practice, current status and the scope in the Indian context. Methods of ground Improvement.

HYDRAULIC MODIFICATION: De-Watering Systems- open sumps and ditches, well point Systems, Vacuum consolidation, Electro osmosis, Sand Drains, Wick Drains, preloading with vertical drains.

UNIT-II

GROUTING TECHNIQUE: Shallow and deep soil stabilization**,** mixing technologies (dry mixing, wet mixing, jet mixing, mass mixing) - stabilization using Cement, lime, bitumen and other chemicals ($CaCl_2$, Gypsum)- Grouting technologies

THERMAL MODIFICATION: Ground freezing-methods, advantages and disadvantages- Vitrification, applicability, Process, Advantages, Limitations of the Technology, Economic and Regulatory Considerations.

UNIT-III

MECHANICAL TECHNIQUE: Compaction methods and compaction control, Vibro techniques (displacement/replacement), Blasting, Deep dynamic compaction, Precompression, Stone columns, lime columns.

UNIT-IV

SOIL REINFORCEMENT TECHNOLOGIES: Mechanically stabilized earth, Foundation and base reinforcement.

REINFORCED EARTH: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

UNIT-V

STABILIZATION OF EXPANSIVE SOILS: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils

– Foundation techniques in expansive soils – under reamed piles.

UNIT-VI

Geosynthetics: Geotextiles, geogrids and geomembranes- Types, Functions and applications. Tests for geotextiles materials.

TEXT BOOKS

1. 'Soil Improvement and ground modifications methods', Peter G. Nicholson, Elsevier, 2020.
2. 'Ground improvement Techniques', P. Purushothama Raj, Laxmi Publications, 2020.
3. Engineering Principles of Ground Modification, Hausmann M.R. (1990), McGraw-Hill International Edition, 2020.

REFERENCES

1. Designing with Geosynthetics, Robert M. Koerner, Prentice Hall New Jercy, USA, 2021.
2. 'Ground Improvement Case Histories', John A. Hudson, Elsevier, 2020.
3. 'Ground and Soil Improvement', C. A. Raison, ICE publications, 20020.
4. Geosynthetics – An Introduction, Sai Master geo-environmental services, Rao, G.V., 2020.
5. "Reinforced Soil and Its Engineering Applications", Saran, S., I.K. international,2020.

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(A0133207) ESTIMATION, COSTING & VALUATION
(Professional Elective-IV)

PREREQUISITES: Building Planning and Construction, Building Drawing,

COURSE OBJECTIVES:
- Impart sound knowledge about the estimation of structures such as buildings, roads and canal.
- Discuss the preparation of tenders, contract documents and rate analysis including the standard specification of materials and works.

COURSE OUTCOMES: At the end of the course student is able to;
- To understand the necessity of estimation, rate analysis, bills, and reinforcement details
- Calculate the quantity required for civil engineering works as per the specifications
- Apply the knowledge of contract and tenders in construction practices.
- To evaluate the health of the Civil Engineering structures

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	3	2	1	2	2	1	3	2	3	1	1
CO2	1	2	-	-	3	2	1	2	2	1	3	2	3	1	1
CO3	1	2	-	-	3	3	3	2	2	3	3	2	3	1	1
CO4	1	2	-	-	3	3	3	2	2	1	3	2	3	1	1

UNIT-I

INTRODUCTION: Philosophy of estimation, purpose of estimation, Different types of estimates- their function and preparation, **estimation quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining wall,** Units of dimensions for materials and work.

UNIT-II

ESTIMATION OF BUILDINGS: Detailed Estimates of Buildings by using centreline & long wall and short wall method. (Single storey with two rooms)

STANDARDS SPECIFICATIONS: General specifications for first class, second class, third class and fourth-class buildings, detailed specifications for various items of works.

UNIT-III

EARTHWORK ESTIMATION: Road estimate: General specifications for modern road, Volume of earthwork, Different methods, Estimation of Earth work for roads, Earthwork for hill roads. Earthwork in canals. **Calculation of quantity of shuttering for different items of RCC work.**

UNIT-IV

RATE ANALYSIS: Need of rate analysis**,** Preparation for analysis of rates. Quantity of materials per unit rate of work, labor **estimate for building works, canals, roads**, Overhead and Contingent charges. Measurement book – bills – types.

UNIT-V

REINFORCEMENT ESTIMATION: Necessity of bar bending schedule, types of bars for construction, Percentage of steel reinforcement, standard hooks and cranks of reinforcement bars, Preparation of Reinforcement bar bending and bar requirement schedules- Beam, RCC Slab, RCC Column**, lintel** and Footing.

UNIT-VI

CONTRACTS AND TENDERS:

CONTRACT: Types of contracts, Formation of contract, Contract conditions, contract problems, Contract for labor, material, design and construction, Drafting of contract document, arbitration and legal requirements.

TENDERS: Types of Tenders, Requirement of Tendering, Corrigendum notice – tender procedures, Drafting model tenders, **Encrypting, decrypting, reverse Auctions.**

VALUATION: Introduction, Purpose of valuation, types of valuation, Gross income, Capitalized value, Annuity, Sinking fund, Depreciation, Methods of depreciation, **escalation, Mortgage lease, Different methods of valuation, Valuation of land** and buildings.

TEXT BOOKS:

1. B.N. Dutta, (2020), Estimating and Costing, UBS publishers.
2. Kohli, D.D and Kohli, R.C., (2013), A Text Book of Estimating and Costing (Civil), S.Chand& Company Ltd.

REFERENCE BOOKS:

1. Chakraborti, M, (2006), Estimation, costing, specifications and valuation in civil engineering – National Halftone Co. Calcutta.
2. Birdie G.S, (2015), A text book on estimating and costing, Dhanpat Rai and Sons, New Delhi.

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(A0145207) PAVEMENT ANALYSIS AND DESIGN
(Professional Elective-IV)

Pre-Requisites: Geotechnical Engineering-I, Engineering Geology and Transportation Engineering.

COURSE OBJECTIVES:
- The course objective covers the design of flexible pavements, design of Rigid pavements, Highway Maintenance, Road side development.

COURSE OUTCOMES:
At the end of the course student is able to
- Characterize the response characteristics of soil, Aggregate, Bitumen
- Analyse flexible and rigid pavements
- Design a flexible and rigid pavement using IRC and AASHTO methods
- Understand the principles of construction and maintains of highways

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-		-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
Avg.	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-

UNIT-I PAVEMENT
Types of pavements – Factors affecting design of pavements – wheel loads –ESWL Concept-tyre pressure –contact pressure, Material characteristics– Environmental and other factors.

UNIT-II STRESSES IN FLEXIBLE PAVEMENT
Layered systems concept – one layer system – Boussinesq Two-layer system –Burmeister Theory for Pavement Design.

UNIT-III STRESSES IN RIGID PAVEMENTS
Relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction.

UNIT-IV PAVEMENT DESIGN
CBR Method of Flexible Pavement Design- IRC method of flexible pavement design. AASHO Method of Flexible Pavement design. IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars.

UNIT-V HIGHWAY MAINTENANCE
Importance of Highway Maintenance Works-Deterioration and Damages in Road Infrastruture-Maintance Requirement in Different Road Components-Distresses in Flexible Pavement and Maintenance

UNIT-VI ROAD SIDE DEVELOPMENT
Environmental and Social Issues in Highway Development-Road side Development and Arboriculture-Control of Soil Erosion.

TEXTBOOKS
1. Pavement Analysis and Design,-Yang H.Huang, 2nd Edition, Prentice Hall,2020
2. Highway Engineering–S.K.Khanna & C.E.G.Justo, Nemchand & Bros, 10th Edition, 2020.

REFERENCES

1. Pavement Design and Materials-A.T.Papagiannakis and E.A.Masad; Wiley & Sons, 2020
2. Pavement Engineering: Principles and Practices - Rajib B.Mallick and Tahar ElKorchi, CRC Press, 2020.
3. Principles of Pavement Design-E.J.Yoder and, M.W.Witzack, Johnwiley & Sons, 2021.

INDIAN ROADS CONGRESS (IRC) SPECIFICATIONS

1. IRC Specification: IRC: 37-2018-Guidelines for Design of flexible pavement.
2. IRC Specification: IRC: 58-2015-Guidelines for Design of plain jointed & Rigid pavement for Highways.
3. IRC Specification: IRC: 81-1997-Guidelines for Strengthening of flexible road pavement.

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(A0136207) REHABILITATION OF STRUCTURES
(Professional Elective-IV)

COURSE OBJECTIVES:
- Provides insight into various maintenance & repair techniques

COURSE OUTCOMES:
At the end of the course, student is able to:
- Understand the reasons for distress in structure and will be able to suggest suitable solutions.
- Understand properties of different building materials. And able to suggest the proper maintenance or repair technique to suit the situation.
- Basic knowledge of using modern tools in maintenance process.
- Understand long-term durability characteristics of structures.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	1	2										2		2
CO2	2	1	1		2								2		2
CO3	2	1	1		2		2						2		2
CO4	2	1			2							2	2		2
Avg.	2	1	2		2		2					2	2		2

UNIT-I INTRODUCTION
Deterioration of Structures – Distress in Structures – Importance-Causes and Prevention. Mechanism of Damage – Types of Damage.

UNIT-II PERFORMANCE OF BUILDING MATERIALS IN SERVICE
Maintenance philosophy – phases of maintenance-routine preventive and curative maintenance- methods, specification and cost analysis- common defects in buildings and measures to prevent and control the same-Building failures- causes and effects- cracks in buildings- types, classification of cracks & investigation.

UNIT-III INSPECTION AND TESTING
Symptoms and Diagnosis of Distress -Damage Assessment -NDT – RCPT –PUDIT-Advantages and disadvantages.

UNIT-IV TECHNIQUES FOR REPAIR
General techniques-Surface repair-material selection-surface preparation –rust eliminators and polymers - coating for rebar during repair – repair of cracks in concrete and masonry – methods of repair- epoxy injection, mortar repair for cracks-gunitinig and shotcreting- Water proofing of concrete roofs.

UNIT-V STRENGTHENING MEASURES
General strengthening techniques -Flexural strengthening, beam shear capacity strengthening, column strengthening, shorting, under pinning and jacketing- Conservation movement-materials and methods for conservation work-examples.

UNIT-VI HEALTH MONITORING OF STRUCTURES
Use of Sensors – Applications-Advantages and disadvantages-Building Instrumentation.

TEXT BOOKS:

1. Maintenance, Repair & Rehabilitation and Minor Works of Buildings - P.C. Varghese – PHI, 2014.
2. Maintenance and Repair of Structures, Sidney M. Johnson- Deterioration, Mc Graw Hill, 2016.

REFERENCES:

1. Maintenance and Repair of Civil Structures,B.L. Gupta and Amit Gupta, Standard Publications,2020.
2. Failure and Repair of Concrete Structure, ChampionS, 2020.
3. Concrete Repair and Maintenance,Peter H. Emmons - Galgotia Publishers, 2021.
4. Building Failures,Mckaig T.M, Applied Science Publications, 2021.
5. Concrete Structures- Repair, water proofing and protection,Philip.H. Perkins, 2020
6. Durable Structures- Through Planning for Preventive Maintenance Raikar, R&D Centre Structural Designers and Consultants Pvt Ltd, Vashi, New Bombay

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(A0144207) ADVANCED STRUCTURAL DESIGN
(Professional Elective-IV)

PREREQUISITES: Structural Analysis and Design of reinforced concrete and steel structures

COURSE OBJECTIVES:
The course objectives of this subject consist of Design of retaining wall, cantilever, Counterfort, RCC water, circular, rectangle tank, chimney, composite slab and tubular member.

COURSE OUTCOMES:
At the end of the course student is able to:

- Design different elements like retaining structures, water tanks, chimneys and silos independently
- Use Indian Standards for design
- Understand the codal provision for loading and design standards for composite slab.
- Design of tubular member

MAPPING OF COs & POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	1	-	-	-	-	1	2	-
CO2	3	3	3	-	-	1	-	-	-	-	-	2	1	2	-
CO3	3	3	3	-	-	-	-	2	-	-	-	-	1	3	-
CO4	3	3	3	-	-	2	-	-	-	-	-		1	3	-

UNIT-I RETAINING WALLS
Introduction – types of retaining walls – stability checks – behaviour of cantilever and counterfort retaining wall - design and detailing of cantilever and counterfort retaining wall – design of shear key – design of counterfort Design Example of Cantilever retaining wall and Counter fort retaining wall.

UNIT-II RC WATER TANKS
Introduction – types of water tanks- Analysis for Self Weight, Water Pressure and Earth Pressure, Design and Detailing of Underground – Square, Rectangle. Design Example of Rectangular water tank and Circular water tank resting on ground.

UNIT-III FLAT-SLAB
Introduction - behaviour and modes of failure - analysis for gravity loads – design and detailing of interior and exterior panel with and without drop. Design Example of interior panel and exterior panel of Flat slab.

UNIT-IV COMPOSITE SLAB
Introduction – design and detailing of composite slab as per IS: 11384-1985 – design of shear connectors. Design example of composite slab

UNIT-V CHIMNEYS
Introduction - stresses due to self-weight, wind, temperature, and combinations of stresses – design and detailing of chimney Design Examples of chimneys and silos using Janssen's theory and Airy's theory.

SILOS
Introduction – design and detailing of circular silo using Janssen's theory and Airy's theory

UNIT-VI TUBULAR MEMBERS

Introduction – design of steel tubular members as per API RP 2A code. Design of Tubular members and tubular joints.

*Relevant IS codes and tables are permitted for examination

TEXT BOOKS

1. Design drawing of concrete and steel structures, N.Krishna Raju, University Press, 2021
2. "Advanced Reinforced concrete structures", Varghese, CBS Publishers,2020

REFERENCE BOOKS

1. "RCC Designs Reinforced Concrete Design)", Punmia B.C. Ashok Kumar Jain and Arun K. Jain, Lakshmi Publishers, 2015.
2. IS:11384 Code of Practice for Composite Construction in Structural Steel and Concrete", Bureau of Indian Standards, New Delhi, 1985.

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(A0137207) INDUSTRIAL WASTE AND WASTE WATER MANAGEMENT
(Professional Elective-V)

COURSE OBJECTIVES:

- Civil Engineers, apart from giving designs for construction of any industry, he must be in a position to calculate the waste produced from that industry. This course motivates the students to learn different concepts and types of industrial sources for waste water production, its quality and quantity of production, different methods to treat industrial waste water so that the effluent will meet the discharge standards.

COURSE OUTCOMES:

At the end of the course, student is able to:

- Understand the basic concepts of industrial waste water.
- Gain knowledge in treatment process for industrial waste water.
- Know the process of disposal, treatment methods and residual management.
- Employ the case studies of industrial manufacturing processes for relevant projects.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					1	2	2					1	1	2
CO2	3	1				1	2	2					1	1	2
CO3	3	1				1	2	2			2		1	1	2
CO4	2					1	2	2				3	1	1	2
Avg.	3	1				1	2	2			2	3	1	1	2

UNIT-I INTRODUCTION

Industrial scenario - Uses of Water by industry. Sources and types of industrial wastewater – Industrial waste water disposal and environmental impacts, **Standards of Disposal**. Reasons for treatment of industrial wastewater – Regulatory requirements - Industrial waste survey, Characterization and variables. Toxicity of industrial effluents. Preventing and minimizing wastes at the source.

UNIT-II INDUSTRIAL WASTE WATER TREATMENT

Equalisation, Neutralisation - Oil Separation, Flotation – Precipitation, Aerobic and Anaerobic biological treatment, Sequencing Batch Reactors. **Waste Reduction-Volume Reduction-Strength Reduction.**

UNIT-III ADVANCE WASTE WATER TREATMENT

Chemical oxidation – Ozonation, Photo Catalysis - Wet Air Oxidation, Evaporation - Ion Exchange - Membrane Technologies - Nutrient removal, **Heavy Metal Removal, Nitrification and De-nitrification**.

UNIT-IV DISPOSAL AND TREATMENT

Industrial waste water discharges into streams, Lakes and oceans and problems, Common Effluent Treatment Plants, Advantages and Suitability, Limitations. **Disposal of Treated Waste Water**, Effluent Disposal Methods.

UNIT-V RESIDUAL MANAGEMENT

Residuals of industrial wastewater treatment, Quantification and characteristics of Sludge, Thickening, digestion, conditioning, dewatering and disposal of sludge, **Ultimate Disposal.**

UNIT-VI CASE STUDIES

Industrial manufacturing process description, Characteristics and Composition of waste water and Manufacturing Processes of Industries like Textiles, Tanneries, Pulp and paper, Chemical

industries, Food processing industries, Steel and Sugar.

TEXT BOOKS:

1) Industrial Water Pollution Control, Eckenfelder, W.W. Mc-Graw Hill, 2000
2) Waste Water Treatment, M.N.Rao & A.K.Datta, Oxford & IBH Publishing Co Pvt. Ltd, 2020

REFERENCES:

1) Wastewater Engineering: Treatment Disposal and Reuse, Metcalf & Eddy, 4th Edition, Tata McGraw Hill, 2017.
2) Pollution Prevention and Abatement Handbook – Towards Cleaner Production World Bank Group (1998) World Bank and UNEP, Washington D, 2020.
3) Wastewater Treatment – Concepts and Design Approach, G L Karia and R A Christian, Prentice Hall of India, 2006.
4) Environmental Engineering, Gerard Kiely, McGraw Hill Education (India) Pvt Ltd, 2013.
5) Wastewater Treatment for Pollution Control, Arceivala, S.J, Tata McGraw Hill, 2008.

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(A0138207) FIRE SAFETY ENGINEERING DESIGN OF STRUCTURES
(Professional Elective-V)

Pre-Requisites: CONCRETE TECHNOLOGY

COURSE OBJECTIVES:

- This course enables the students to know about design concerns – Regulatory control – Fire precautions during construction and maintenance. Students can also learn behaviors of fires, behavior of different materials at different temperatures

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Understand about fire protection
- Understand the prevention of fire using different protection methods
- Design of building elements corresponding to fire protection
- To know the application of fire protection in other disciples

MAPPING OF COs & POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	1	-	1	-	1	-	3	2	-
CO2	3	3	2	2	3	-	1	-	1	-	1	-	3	2	-
CO3	2	3	2	3	2	-	1	-	1	-	1	-	3	2	-
CO4	3	2	3	2	3	-	1	-	1	-	1	-	3	2	-

UNIT-I THE FIRE PROCESS

Fire Triangle, Fire Tetrahydran, Fuels, Smouldering, Metal Fires, Combustion and Dusts, Ease of Ignition, Heat, Ignition Processes, Fire Stages, Structure of Flames

WHAT IS FIRE PROTECTION ENGINEERING?

The Discipline, The Professional Society, What FPEs Do, How Fire Protection Engineering Differs

UNIT-II FUNCTIONS OF FIRE PROTECTION SYSTEMS

Basics of Detectors and Alarms, Types of Detectors, Preventing and Protecting Against Fire, Reasons for Installing Fire Protection Systems, Protecting Assets,
Relating Design Features to Function

UNIT-III DESIGN ELEMENTS

Performance-Based Fire Protection Design, Design Elements, Fire Science, Design Fire Scenarios, Other Design Considerations, Examples of Performance-Based Design

UNIT-IV PRESCRIPTIVE FIRE PROTECTION DESIGN

Desirability of Prescriptive Design, Prescriptive Codes, Inherent Risk, Design Coordination Design Constraints

UNIT-V INTERFACING WITH THE OTHER DISCIPLINES

Architectural, Chemical, Electrical, Mechanical, Structural

UNIT-VI FIRE PROTECTION FOR NEW AND EXISTING BUILDINGS

The Design Process, New Construction, Existing Buildings

TEXTBOOKS:

1) Principles Of Fire Safety Engineering: Understanding Fire And Fire Protection By Das, Akhil Kumar
2) Fire protection Engineering in Building Design,Jane N Lataille, (2003),Butterworth-Heinemann Publishers.
3) Fire Safety Engineering Design of Structures, John A. Purkiss, (2014), CRC Press.

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(A0140207) WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT
(Professional Elective-V)

COURSE OBJECTIVES:

- Water resource systems deals with modelling techniques for optimum utilization of the available water resources in a system. This course emphasison the basics of systems technique in water resources with illustrative examples, and potential applications to real systems.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Understand the concepts of system and system analysis
- Get the knowledge about systems techniques in water resources
- Understand the economic considerations in water resource systems
- Analyse reservoir systems-deterministic and random inflow
- Get the knowledge of applications of linear and dynamic programming

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3				1				2	1	1		1
CO2	3	3	3		2		1			1	2	1	1		1
CO3	3	3	3			3	1	2		1	3	1	1		1
CO4	3	3	3	3			1	2		1	1	1	1		1
CO5	3	3	3	3	2		1		2	1	1	1	1		

UNIT – I CONCEPT OF SYSTEM AND SYSTEM ANALYSIS

Definition of a system, Principles and need for system planning & management, planning & management aspects, types of a systems, systems approach, system analysis, basic problems in systems analysis and example problems.Techniques of water Resources system Analysis.

UNIT – II SYSTEM TECHNIQUES IN WATER RESOURCES

Optimization using calculus, function of a single and multiple variables:Unconstrained Optimization, Constrained Optimization; linear programming, prelude to simplex method, dual simplex method, matrix form, sensitivity analysis, dynamic programming, solution of DP problems, characteristics of a DP problem, application of DP, multiple state variables, simulations, simulation model, simulation runs, combination of simulation and optimizations. Introduction to Non-linear Programming and Genetic Algorithms.

UNIT- III ECONOMIC CONSIDERATIONS IN WATER RESOURCE SYSTEM

Basics of engineering economics, general principles, discount factors, comparison of alternative plans, economic analysis, market demand and supply, aggregation of demand, conditions of project optimality, benefitcost analysis, Benefits and Costs, Cost and benefits curves, cost and benefits estimation. Introduction of how to dealing the multi objective planning.

UNIT – IV RESERVOIR SYSTEMS-DETERMINISTIC INFLOW

Reservoir sizing, sequent peak analysis, Reservoir capacity using linear programming, storage yield function, reservoir operation, standard operating policy, optimal operating policy, multireservoir operation, stationary policy, simulation of reservoir operation for hydropower generation.

UNIT – V RESERVOIR SYSTEMS-RANDOM INFLOW

Review of basic probability theory, probability distributions, chance constrained linear programming, concept of reliability, stochastic dynamic programming for reservoir operation, state variable discretization, inflow as a stochastic process, steady state operating policy, real time operation

UNIT – VI APPLICATIONS OF LINEAR AND DYNAMIC PROGRAMMING

Irrigation water allocation for single and multiple crops, crop yield optimization, multi reservoir system for irrigation planning, realiability capacity tradeoff for multicrop irrigation, reservoir operation for irrigation, reservoir operation for hydro power optimization, application of dynamic programming, optimal crop water allocation, steady state reservoir operating policy for irrigation, real time reservoir operation for irrigation.Introduction to Artificial Intelligence (AI) tools: ANN and some Fuzzylogic, Fuzzy optimization techniques

TEXT BOOKS:

1) Water resources systems- modelling techniques and analysis – S. Vedula and PP Mujumdar, 2020
2) Water resources system analysis – S. Vedula and PP Mujumdar- Tata Mc Graw Hill company Ltd.2019

REFERENCES:

1) Water resource economics- James & Lee Oxford publishers 2005.
2) Optimal design of water distribution networks P.R.Bhave and Narosha publishing house 2005.
3) Operation research by P. Shankar Iyer, TMH publications, New Delhi, 2020
4) Operation research by N. Ramanathan, TMH publications, New Delhi, 2019.
5) Chaturvedi, M.C. “Water Resources Systems Planning and Management”, Tata McGraw Hill Pub.Co., N Delhi, 1987.

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(A0143207) EARTHQUAKE RESISTANT DESIGN
(Professional Elective-V)

Pre-requisites: Physics, Mathematical Methods and Engineering Mechanics.

COURSE OBJECTIVES:

The course objective of this subject consists of Introduction to earthquake, terminology, classifications, causes, effects, formulations of single degree of freedom & multi degree of freedom. Design of shear walls.

COURSE OUTCOMES:

At the end of the course student is able to:

- Understand about the Earthquake Phenomenon and its features related to earthquake terminology.
- Apply the various vibrations on SDOF and MDOF systems.
- Analyse any structure subjected to earthquake.
- Design of various structures subjected to earthquake.
- Get knowledge regarding codal methods of analysis.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	1	3	-	1	-	1	-	2	2	2
CO2	3	2	-	-	-	2	-	-	1	-	1	-	3	1	3
CO3	1	3	1	1	2	-	-	-	1	-	1	-	3	2	3
CO4	-	-	3	2	3	-	2	-	1	-	1	-	3	3	3
CO5	-	-	2	3	1	-	2	-	1	-	1	-	3	3	3

UNIT-I EARTHQUAKE ENGINEERING

Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicentre etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes-Seismic Waves- Seismic Zones – Seismograms and Accelerograms.

UNIT-II INTRODUCTION TO STRUCTURAL DYNAMICS

Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation - Half-power band width – Earthquake response analysis of single storied buildings - Concept of response spectrum.

UNIT-III DESIGN CODAL PROVISIONS

Review of the latest Indian seismic code IS:1893 – 2023 (draft)Part-I&II provisions for buildings – Earthquake design philosophy –Assumptions – Analysis by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion – Analysis of a multi-storey building using Seismic Coefficient method.

CODAL DETAILING PROVISIONS

Review of the latest Indian codes IS: 13920 -2016 Provisions for ductile detailing of R.C buildings – Beam, column and joints- Example Problem on ductile detailing of Multi-storey Building.

UNIT-IV HORIZONTAL AND VERTICAL IRREGULARITIES

Regular and Irregular configurations - lateral forces - Design imposed loads for earthquake force calculation - Torsion - RC frames buildings with open storeys - Deformations – Pounding

effects.

UNIT-V ANALYSIS FOR EARTHQUAKE LOADS

IS: 1893-2023(draft) Part-I&II - Seismic Coefficient method- modal analysis- Applications to multi-storied building frames.

UNIT-VI SHEAR WALLS

Types – Design of Shear walls with Boundary Element as per IS: 13920-2016 – Detailing of reinforcements.

TEXT BOOKS:

1. "Dynamics of Structures", A.K. Chopra, Pearson Education, Delhi, 2020
2. "Dynamics of Structures", Clough & Penzien, 2003, McGraw Hill – International Edition, 2021.

REFERENCEBOOKS

1. "Earthquake Resistant Design of Structures", Pankaj Agarwal & Manish Shrikhande, Prentice Hall of India, New Delhi, 2021.
2. IS Codes: IS: 1893 - 2016, IS: 4326 and IS: 13920 - 2016.

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(A0141207) FINITE ELEMENT METHODS IN CIVIL ENGINEERING
(Open Elective-III)

Prerequisites: Mathematical Methods and structural analysis

COURSE OBJECTIVES:

- This is an introductory course to understand and applies the finite element method for various Civil Engineering applications. This course provides to learn different concepts of finite element methods to generate the stiffness matrices for different elements.

COURSE OUTCOMES:

At the end of the course student is able to:

- Understand the fundamental ideas of FEM.
- Develop shape functions and stiffness matrices for different elements
- Generate global stiffness matrices and global load vectors
- Have knowledge on generation of shape function for higher order elements.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	-	1	-	1	-	1	-	3	3	-
CO2	2	3	-	-	2	-	1	-	1	-	1	-	3	3	-
CO3	2	3	-	-	2	-	1	-	1	-	1	-	3	3	-
CO4	3	3	-	-	2	-	1	-	1	-	1	-	3	3	-

UNIT- I FUNDAMENTAL CONCEPTS

Introduction-historical background-Boundary Conditions- Equilibrium equations derivation - Strain displacement relationship derivation-Stress-strain relationship derivation-plane stress and plane strain-Temperature effects-potential energy-Equilibrium-Rayleigh-Ritz method-Saint venant's principle - Problems

UNIT-II ONE DIMENSIONAL FEM

Introduction-Bar element: construction of shape functions, generation of stiffness matrix, stress strain calculations and related problems. Finite element modeling-Coordinates and shape functions-Potential Energy Approach-Problems

UNIT-III TWO-DIMENSIONAL FEM

Introduction-Finite element modelling-Constant Strain Triangle-shape functions-Iso-parametric representation-potential energy approach-Element Stiffness-Force Terms-Stress calculations-problems

UNIT-IV ISOPARAMETRIC ELEMENTS (2D)

Introduction-Four node Quadrilateral-numerical Integration- Four node Quadrilateral-higher order elements Eight node Quadrilateral

UNIT-V BEAMS AND FRAMES

Introduction-Potential Energy Approach-Finite element formulation- Hermite shape functions-Load Vector-Boundary Conditions-Shear force and Bending moment-problems

UNIT-VI AXISYMMETRIC SOLIDS

Introduction-Axisymmetric Formulation-Finite element modeling-Triangular Element-Potential Energy Approach-Body force term- Surface Traction-Stress calculations

TEXTBOOKS

1. Introduction to Finite Elements in Engineering, TR Chandrupatla and AD Belegundu, Third Edition, Phi Learning, USA, 2020.
2. Finite Element Analysis: Theory and Practice, CS Krishnamoorthy, Second edition, McGraw Hill Inc., New Delhi, 2020.

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(A0142207) GLOBAL WARMING AND CLIMATE CHANGE
(Open Elective-III)

COURSE OBJECTIVES:
- To know the basics, importance of global warming
- To know the concept of mitigation measures against global warming
- To know the impacts of climate changes

COURSE OUTCOMES:
At the end of the course student is able to:
- Understand the components of atmosphere and its characteristics.
- Understand the green house effects and impact of the climate change.
- Analyse the protocols with observed changes along with its causes
- Evaluate the climate changes and mitigation measures.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	-	2	3	1	1	1	1	2	1	1	-
CO2	3	1	1	1	-	2	3	1	1	1	1	2	1	1	-
CO3	3	1	1	1	-	2	3	1	2	1	1	2	1	1	-
CO4	2	1	1	1	-	2	3	1	2	1	1	2	1	1	-
Avg.	3	1	1	1	-	2	3	1	2	1	1	2	1	1	-

UNIT I EARTH'S CLIMATE SYSTEM
Role of ozone in environment-ozone layer-ozone depleting gases-Green House Effect, Radioactive Effects of Greenhouse Gases-The Hydrological Cycle-Green House Gases and Global Warming – Carbon Cycle. Global warming impacts, Vienna convention and Montreal protocol

UNIT II ATMOSPHERE AND ITS COMPONENTS
Atmosphere and its layers, Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric Stability-Temperature profile of the atmosphere-Lapse Rates-Temperature inversion-effects of inversion on pollution dispersion.

UNIT III IMPACTS OF CLIMATE CHANGE
Causes of Climate change: Change of Temperature in the environment – Melting of ice and sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Risk of Irreversible Changes. Effects of climate change on plants and animals.

UNIT IV OBSERVED CHANGES AND ITS CAUSES
Climate change and Carbon credits- CDM- Initiatives in India-Kyoto Protocol Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC –Evidence of Changes in Climate and Environment – on a Global Scale and in India. Separate human and natural influences on climate

UNIT V CLIMATE CHANGE MEASURES
Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Solar Energy – Wind – Hydroelectric Power, Bio power and geothermal energy.

UNIT VI MITIGATION MEASURES

Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste, hazardous wastes, e-wastes).

TEXT BOOK:

1. Dash Sushil Kumar, Climate Change – An Indian Perspective, Cambridge University Press India Pvt. Ltd., 2007.
2. Jerry Silver , Global Warming and Climate Change Demystified, McGraw-Hill Professional, 2008.

REFERENCE BOOKS:

1. J.M. Wallace and P.V. Hobbs, Atmospheric Science, Academic Press, 2006.
2. Frances Drake, Global Warming: The Science of Climate Change, Hodder Arnold Publication, 2000.
3. Jan C. van Dam, Impacts of Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press, 2003.
4. Adaptation and mitigation of climate change – Scientific Technical Analysis. Cambridge University Press, Cambridge,2006.
5. R.T. Watson, M.C. Zinyowera and R.H. Moss, Climate Change Impacts, Adaptations and Mitigation of Climate Change - Scientific-Technical Analysis, Cambridge University Press, 1996.

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(A0134207) DISASTER PREPAREDNESS AND PLANNING MANAGEMENT
(Open Elective-III)

COURSE OBJECTIVES:
- To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters.
- To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
- To understand Impacts of Disasters Key Skills.

COURSE OUTCOMES:
At the end of this course, students will be able to:
- To understand the basic concepts of disaster, Economic Damage & losses & types of disasters.
- A comprehensive study of disaster-prone areas in India various aspects etc, including post-disaster diseases and epidemics.
- To monitoring the disaster and Evaluation of Risk, Application of Remote Sensing. Data collecting from various Agencies & Governmental and Community Preparedness.
- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction & Assessments, Strategies of Disaster Mitigation.
- Adoption of sustainable development methods & factors affecting vulnerability.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3			1		3	3	2	2	2	1	3	1	3	2
CO2	2	1	1	1	2	2	3	3	2	2	1	3	1	3	2
CO3	2	2	1	2	1	2	3	3	2	2	1	3	1	3	2
CO4	2	2	1	2	1	2	3	3	2	2	1	3	1	3	2
CO5	2	1	1	2	1	2	3	3	2	2	1	3	1	3	2
Avg	2	1	1	2	1	2	3	3	2	2	1	3	1	3	2

UNIT-I
Introduction: Concepts & Definitions of Disaster, Vulnerability, Resilience, Hazard Risks Severity, Frequency and Details, Capacity, Impact, Prevention, Mitigation. Factors and Significance; Difference Between Hazard and Disaster.

UNIT-II
Effects of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.
Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches,
Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III
Disasters Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-IV
Disaster Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk, Application of Remote Sensing. Data from Meteorological and Other Agencies, Media Reports, Governmental and Community Preparedness.

UNIT-V

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Strategies for Survival. Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation. Programs of Disaster Mitigation in India.

UNIT-VI

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications, sustainable and environmental friendly recovery; reconstruction and development methods.

TEXTBOOKS:

1) R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal Book Company, 2021.
2) Sahni, Pardeep (Eds.), "Disaster Mitigation Experiences and Reflections", PHI, New Delhi, 2004.

REFERENCE BOOKS:

1) Ghosh G.K., Disaster Management, APH Publishing Corporation, 2006
2) Larry R. Collins, Disaster Management and Preparedness, Kindle Edition, 2000.
3) Goel S. L., Disaster Administration and Management: Text and Case Studies, Deep & Deep Publication Pvt. Ltd., New Delhi, 2007.
4) Singh B.K., Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication, 2008
5) Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, 2003.
6) Inter-Agency Standing Committee (IASC) Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC, 2007
7) http://ndma.gov.in/ (Home page of National Disaster Management Authority).

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(A0135207) ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT
(Open Elective-III)

COURSE OBJECTIVES:

- Define and Classify Environmental Impacts and the terminology
- Understands the environmental Impact assessment procedure and methodology
- List and describe environmental audits

COURSE OUTCOMES:

At the end of the course, student is able to:

- Understand the concept of EIA and its methodology.
- Assess the quality of environmental impact on Land uses, vegetation, air and wild life.
- Prepare EIA reports and environmental management plans
- Study and rectification of case studies.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	3	1			1	1	2	3	1	1	1	1		1	2
CO2	2	1			1	1	2	3	1	1	2	1		1	2
CO3	2	1			1	1	2	3	1	1	2	1		1	2
CO4	2	1			1	1	2	3	1	1	2	1		1	2

UNIT-I BASIC CONCEPT OF EIA

The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle, Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, participants in EIA process and main stages of EIA process, Classification of environmental parameters.

UNIT- II EIA METHODOLOGIES

Introduction, Criteria for the selection of EIA Methodology, E-I-A methods, Ad-hoc methods, Leopold Interaction matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis. EIA review- Baseline Conditions - Construction Stage Impacts, post project impacts.

UNIT-III QUALITY ASSESSMENT OF NATURAL SOURCES AND POLLUTION USING EIA

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives, Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation. Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

UNIT-IV ENVIRONMENTAL MANAGEMENT PLAN:

EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT-V ENVIRONMENTAL LEGISLATION AND LIFE CYCLE ASSESSMENT

Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.

Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria- case studies.

UNIT-VI CASE STUDIES

Case studies and preparation of Environmental Impact assessment statement for various Industries namely thermal power plants, pharmaceutical industries, Water Resources Project, Nuclear fuel complex, Sewage treatment plant, Air ports.

TEXT BOOKS:

1. Y. Anjaneyulu, Environmental Impact Assessment Methodologies, B.S. Publication, Hyderabad, 2019.
2. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York, 2020.

REFERENCE BOOKS:

1. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002
2. Suresh K. Dhaneja, Environmental Science and Engineering, S.K.Katania & Sons Publication, New Delhi, 2021.
3. Petts, J., Handbook of Environmental Impact Assessment Vol. I and II, Blackwell Science, London, 2020.
4. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.
5. Environmental Assessment Sourcebook Vol. I, II and III, The World Bank Group, The World Bank, Washington, 2020.

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(A0139207) WATERSHED MANAGEMENT
(Open Elective-IV)

COURSE OBJECTIVES:

- Watershed management is a planning and implementation process that looks at the total picture of all the water uses, demands, pollutant sources, stresses and conditions, to achieve water quality, supply, flows and ecosystem health that meet society's goals.

COURSE OUTCOMES:

At the end of the course student is able to:

- Understand the Concept of watershed development.
- Understand the characteristics of watershed used in watershed management
- Practice watershed management basics, interacting with local interests and dealing with real issues in a practical manner
- Plan watershed management activities and prepare plan of action.
- Understand the modern techniques used in Watershed management

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO2	2	2		-	-	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	1	2	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	1	2	-
CO5	1	1	3	-	-	-	-	-	-	-	-	-	1	2	-

UNIT-I INTRODUCTION

Concept of watershed management, History of watershed management and its relevance in India, Objectives and Policies of Watershed Development, Effect of watershed on community.

UNIT-II WATERSHED MODELLING

Characteristics of Watershed

Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, Master plan, administrative aspects. Watershed Delineation and Modeling

UNIT-III SUSTAINABLE WATERSHED APPROACH AND WATERSHED MANAGEMNT PRACTICES

Sustainable watershed management, Agriculture Practices and watershed management, soil erosion and conservation, principles of erosion factors affecting soil erosion, cost of soil erosion, estimation of loss of soil from erosion, control of soil erosion, conservative measures

UNIT-IV INTEGRATED WATERSHED MANAGEMENT

Integrated water resources management, conjunctive use of water resources, Rainwater Harvesting and Roof catchment systems

UNIT –V LAND MANAGEMENT

Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT –VI USE OF MODERN TECHNIQUES IN WATERSHED MANAGEMNET

GIS and its applications in watershed management, Remote sensing and its applications in watershed management

TEXTBOOKS

1) "Watershed Management" by MM Das and MD Saikia,PHI Learning Pvt Ltd,New Delhi, 2021 "
2) "Watershed Management" by JVS Murthy,-New Age International Publishers, 2021.

REFERENCES

1) Water Resource Engineering R. Awurbs and WP James, - Prentice Hall Publishers, 2020.
2) Land and Water Management VVN Murthy, - Kalyani Publications, 2020.
3) Irrigation and Water Management, D.K.Majumdar, Printice Hall of India, 2020.

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(A0146207) CONSTRUCTION METHODS & EQUIPMENT
(Open Elective-IV)

COURSE OBJECTIVES:

- Provide knowledge about various construction methods.
- Provide knowledge about various types of construction equipment.

COURSE OUTCOMES:

- Understand operations of various construction equipment's
- Understand construction project control processes
- The total construction process from inspection of the idea through construction and start up
- Construction equipment should be selection and use to produce the intended quality in the most cost-effective manner

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3	2	1
CO2	3	2											3	2	1
CO3	3	2											3	2	1
CO4	3	2											3	2	1

UNIT-I INTRODUCTION - EQUIPMENT ECONOMICS

The history of construction equipment, safety, planning equipment utilization, Equipment records, Cost of Capital, Elements Operating Cost, , Rent and Lease Considerations.

UNIT-II PLANNING FOR EARTHWORK CONSTRUCTION

Planning, Graphical Presentation of Earthwork, Earthwork Quantities, , Pricing Earthwork Operations.

UNIT-III COMPACTION AND STABILIZATION EQUIPMENT

Compaction of Soil and rock, Types of Compacting Equipment, Dynamic Compaction, Stabilizing soils with Lime, Cement Soil Stabilization.

UNIT-IV MACHINE EQUIPMENT POWER REQUIREMENTS

Required Power, Available power, Usable power,. Dozers- pushing material, land clearing, ripping rock, Scrapers- types, operation, production cycle, scraper safety, Excavators- front shovels, hoes, loaders.trucks, cranes,finishing equipment.

UNIT –V CONCRETE AND CONCRETE EQUIPMENT

Piles and Pile-Driving Equipment, - Concrete Mixtures, Batching of Concrete, Placing of Concrete, Consolidating and Finishing,

UNIT-VI PLANNING FOR BUILDING CONSTRUCTION

Introduction, Control of Construction Nuisances, forming systems- Classification, Formwork Design, Formwork Economics, Safety

TEXTBOOKS

1. "Construction Planning Equipment and Methods", Peurifoy R.L, Ledbetter W.B, and Schexnayder C, 9th Edition, McGraw Hill, Singapore, 2020.
2. "Construction Equipment and Management ", Sharma S.C, Khanna Publishers, 2020.

REFERENCES

1) "Construction Equipment and Methods: Planning, Innovation, Safety", Leonhard E. Bernold Wiley Publisher2020.

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(A0147207) URBAN TRANSPORTATION PLANNING
(Open Elective-IV)

COURSE OBJECTIVES:

- Impart the knowledge of urban transportation system.
- Developing analytical and comprehensive approach to select appropriate mode of transportation.

COURSE OUTCOMES:

At the end of the course students will be able to:

- Interpret the urban activity system and travel patterns
- Demonstrate the classical methods of urban transportation planning
- Apply four stage travel demand modelling
- Understand the trip generations and trip distribution concepts
- Understand the mode and route choice of trip makers

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PSO3
CO1	2	2	1	2	2									3	
CO2	2	2	1	2	2									3	
CO3	2	2	1	2	2									3	
CO4	2	2	1	2	2									3	
CO5	2	2	1	2	2									3	

UNIT-I

Introduction to Urban Planning: Urban morphology - Urbanization and travel demand – Urban activity systems and travel patterns – Systems approach – Trip based and Activity based approach - Urban Transportation Planning – Goals, Objectives and Constraints - Inventory, Model building, Forecasting and Evaluation - Study area delineation – Zoning - UTP survey.

UNIT-II

Trip generation models: Trip classification - productions and attractions – Trip rate analysis - Multiple regression models - Category analysis - Trip distribution models – Growth factor models, Gravity model and Opportunity modes.

UNIT-III

Modal split models: Mode choice behaviour – Trip end and trip interchange models- Probabilistic models - Utility functions - Logit models - Two stage model - Traffic assignment –Transportation networks – Minimum Path Algorithms - Assignment methods – All or Nothing assignment and Multi path assignment - Route-choice behaviour.

UNIT-IV

User Equilibrium assignment: System optimum assignment - Incremental assignment - Capacity restraint assignment - Stochastic user equilibrium assignment - Dynamic Assignment.

UNIT-V

Transportation Survey: Introduction - Types of Movement-Types of Surveys- Home-interview survey , Commercial Vehicle Survey , Innovative Commercial Vehicle Tracking Methods , Cordon-Line Survey

UNIT-VI

Land use transportation models: – Urban forms and structures - Location models - Accessibility– Land use models - Lowry derivative models – Micro level Planning- International Practice.

TEXTBOOKS:

1) Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, NJ, 2007..
2) Papacostas C.S. and Prevedouros, P.D., Transportation Engineering & Planning, PHI, New
3) Hutchinson, B.G., Principles of Urban Transport Systems Planning, Scripta, McGraw-Hill,NewYork, 1974.

REFERENCES:

1) Black, Alan, Urban Mass Transportation Planning, McGraw- Hill, Inc., New York, 1995.
2) Vukan, R. Vuchic, Urban Transit Systems and Technology, John –Wiley & Sons, New Jersey, 2007.
3) National Urban Transport Policy

WEB REFERENCES:

1) https/www.coursera.org
2) www.nptel.ac.in/courses

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(A0148207) TRAFFIC ENGINEERING
(Open Elective-IV)

Pre-requisites: Transportation Engineering**.**

COURSE OBJECTIVES:

- The course objective covers the traffic characteristics, traffic measurements, Highway capacity, parking studies, Traffic signs and road markings, Traffic Control aids

COURSE OUTCOMES:

At the end of the course student is able to

- Identify traffic stream characteristics
- Implement traffic studies, traffic regulations and control
- Identify various types of sign boards and road markings on Indian National highways
- Understand elements of highway safety and approaches to accident studies.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3													3	
CO2	3								3					3	
CO3	3													3	
CO4	3													3	

UNIT-I TRAFFIC CHARACTERISTICS

Basic characteristics of Traffic, Vehicles, road users Relationship among Traffic parameters.

UNIT-II TRAFFIC ENGINEERING

Basic Parameters of Traffic-Volume, Speed and Density – Definitions and the inter relation - Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation-Origin &Destination(O&D) studies, Speed and Delay studies; Axle load studies; Capacity studies - Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams

UNIT-III PARKING STUDIES

Types of parking facilities–On street and Off - Street Parking Facilities – Parking Studies-Parking Inventory Study– Parking Survey by Patrolling Method- Analysis of Parking Data and parking characteristics – Multi Story Car Parking Facility- Design standards.

UNIT-IV TRAFFIC CONTROL & REGULATION

Traffic Problems in Urban areas – Importance of Traffic Control and regulation-Traffic Regulatory Measures – Channelization.

UNIT-V TRAFFIC SIGNSAND ROADMARKINGS

Types of Traffic Signs - cautionary, Regulatory and Informative Signs – Specifications – Pavement Markings – Types of Markings – Lane markings and Object Markings –Standards and Specifications for Road Markings.

UNIT-VI MISCELLANEOUS TRAFFIC CONROL AIDS AND STREET FURNITURE

Traffic Aids and Street Furniture-Principles of Street Furniture Design-Roadway Delineators-Hazard Delineators- Hazard Makers- Object Markers- Speed Breakers- Rumble Strips.

TEXTBOOKS

1. Highway Engineering–S.K.Khanna & C.E.G.Justo,Nemchand &Bros,10th Edition, 2021.

2. Dr.Kadiyali L. R., Traffic Engineering and Transport Planning, Khanna Publishers, 2020.

REFERNCEBOOKS

1. Practice and Design of Highway Engineering (Including Airports), Dr. Sharma S. K., Principles, S. Chand & Company Ltd, 2019.
2. Principles of Transportation Engineering Chakraborty Partho, Das Animesh, PHI, 2019.
3. A course in Highway Engineering Bindra S.P., Dhanpat Rai Publications, 2020.
4. Principles & Practice of Highway Engineering, Kadiyali L. R. and Lal, N. B.,Khanna Publishers, Delhi, 2020.
5. Principles of Transportation Engineering, Chakraborty Partha, Das Animesh, 2016.
6. Indo-Highway Capacity Manual, 2018
7. Martin Whol, Brian V Martin, Traffic system Analysis for Engineers and Planners, McGraw Hill, NY, 1967

IRC CODEBOOKS

1. IRC-SP -12 2015 Parking facilities in Urban Roads
2. IRC SP - 41 Guidelines for the Design of At-Grade Intersection
3. IRC 35 - 2015 Code of Practice for Road Markings – Second Revision
4. IRC 67 - 2001 Road Signs
5. IRC 108 - 2015 Guidelines for traffic forecast on Highways
6. IRC 119 - 2015 Guidelines for traffic safety Barriers
7. IRC 65 - 1976 Traffic Rotaries
8. IRC 93 - 1985 Design & Installation of Road Traffic Signals

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(A0149207) NUMERICAL METHODS IN CIVIL ENGINEERING
(Skill Development Course)

Prerequisites: Mathematics and Mathematical Methods

COURSE OBJECTIVES:

- To familiarize the students with the foundations of probability and Numerical methods and applications in Civil Engineering domain**.**
- To impart probability concepts and Numerical methods in various applications in Engineering.

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Know the importance of probability, random variables and distributions in solving various mechanical and civil engineering problems
- Identify various numerical methods to solve linear and non-linear ordinary differential equations and its applications in non-linear analysis
- Analyse the concept of Interpolation its applications in digital image processing, computer graphics and in many engineering disciplines
- Identify various numerical methods to solve linear and non-linear ordinary differential equations and its applications in non-linear analysis

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	1	-	1	-	-	-	2	1	-
CO2	3	3	2	2	3	-	1	-	1	-	-	-	2	1	-
CO3	2	3	2	3	2	-	1	-	1	-	-	-	2	1	-
CO4	3	2	3	2	3	-	1	-	1	-	-	-	2	1	-

UNIT-I ROLE OF PROBABILITY AND STATISTICS IN ENGINEERING

Introduction – Uncertainty in engineering: Aleatory uncertainty and epistemic uncertainty – Applications in CE: Transportation infrastructures, Design of structures, Design of hydro systems, Design of geotechnical systems, Construction planning and management, Applications in quality control and assurance

UNIT-II ANALYTICAL MODELS OF RANDOM PHENOMENON

Random variables and random phenomenon – probability distributions: Normal, Guassian, log normal, Poison, exponential, gamma, binomial, beta distributions.

UNIT-III LINEAR REGRESSION AND CORRELATION ANALYSES

Introduction – applications of regression analysis in engineering - fundamentals of linear regression analysis – correlation analysis – univariate linear regression analysis - linear regression – multivariate linear regression analysis - multiple linear regression – nonlinear regression.

UNIT-IV BAYESIAN APPROACH

Introduction – basic concepts – continuous case – discrete case – Bayesian concept in sampling theory – Bayesian regression and correlation analysis.

UNIT-V NUMERICAL METHODS

Introduction – Two Dimensional Integrals, stiffness integration, stress calculation, four node and eight noded Quadrilateral Integration

UNIT-VI DIFFERENTIAL EQUATIONS

Introduction – Taylor series simulations – Runge Kutta's method – 1D and 2D wave equations partial differential equations

TEXT BOOKS:

1. Probability concepts in engineering, AHS Ang, and WH Tang, Wiley publishers, 2020
2. Mathematical methods for physics and engineering, KF Riley, MP Hobson, SJ Bence (2006), Cambridge University Press,2020

REFERENCES:

1. Probability concepts in Engineering, AHS Ang, and WH Tang, Wiley publishers, 2020
2. Mathematical methods for physics and engineering, KF Riley, MP Hobson, SJ Bence, Cambridge University press,2021
3. Introduction to finite element in Engineering, TR Chandrupatla, and AD Belegundu, Prentice Hall Publishers, 2021.

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(A0150207) GREEN BUILDINGS
(Humanities and Social Sciences)

COURSE OBJECTIVES:

- Provide knowledge about Green Buildings and their characteristics.
- Provide insight about various Green Building Rating systems.
- Provide insight about various parameters of Green Buildings
- Provide knowledge about ECBC Code.

COURSE OUTCOMES:

- Understand the need of Green Buildings, their characteristics and various assessment methods.
- Understand the design parameters of Green Building like sustainable sites, water efficiency, energy &atmosphere, materials& resources, indoor environmental quality & innovation and able to assess the buildings as per IGBC & GRIHA rating systems.
- Understand the ECBC code and application to existing green building. Also understand and apply the principles and planning concepts of green buildings to design of buildings.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	1	1
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1
CO3	3	2	1	-	-	-	-	-	-	-	-	-	2	1	1

UNIT-I INTRODUCTION OF GREEN BUILDING

Concept of green building, Need of green building in present scenario, Importance of green building, Merits and demerits. Sustainable Buildings

UNIT-II CLASSIFICATION OF GREEN BUILDING

Assessment methods, Global assessment and certification, BREEAM (Building Research Establishment's Environmental Assessment Method), GB Tool, LEED (Leadership in Energy and Environmental Design), CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), Green Globes, Local assessment, LEED India, GRIHA (Green Rating for Integrated Habitat Assessment). Scenarios for each classification of green buildings

UNIT-III DEVELOPMENT OF ENERGY EFFICIENT BUILDING

Introduction, Concept, Advantages, Design parameters, Sustainable Sites, Water Efficiency renewable energy utilization.

UNIT-IV ENERGY & ATMOSPHERE

Materials & Resources, Indoor Environmental Quality, An additional category Innovation & Design criterion, energy performance optimization.

UNIT-V ENERGY CONSERVATION BUILDING CODE

Study of existing green buildings. Types of energy building codes- ASHRAE -2019, IECC 2021, Title-24- 2019

UNIT-VI PRINCIPLES AND PLANNING CONCEPTS OF GREEN BUILDINGS

Benefits of green Buildings Planning concepts of Green Buildings or Eco-housing, Environmentally Friendly, Non-Toxic Paint, Green Roofing, Use of Insulating Materials, Cost Effective Housing.

TEXTBOOKS:

1. Renewable Energy and Environment -H.Ravindranath, K UshaRao, B Nataraja n, P Monga, A Policy Analysis for India,Tata McGraw Hill, 2020.
2. "Green and Smart Buildings: Advanced Technology Options",Nilesh Y. Jadhav,Green Energy and Technology Series: Springer (Publisher), Edition-1,2021.

REFERENCES:

1. "Construction Planning, Equipment, and Methods", Robert L.Peurifoy, Clifford J. Schexnayder, Robert Schmitt, Aviad Shapira P/L CUSTOM SCORING SURVEY Ninth Edition, 2020.
2. Energy and the Environment, M Fowler, 2nd Ed, McGraw Hill, New York, 2020.
3. "Green Buildings and Sustainable Engineering", Harald Drück, Radhakrishna G. Pillai, Manoj G Tharian, AyshaZeneeb Majeed Springer Transactions in Civil and Environmental Engineering, (1st ed).2020.

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(A0015203) UNIVERSAL HUMAN VALUES

(Mandatory Learning Course)

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- This course is developed to design a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- The main objective of this course is to help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

COURSE OUTCOMES:

- To create a holistic perspective based on self-exploration
- The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
- The students are able to see that they can enlist their desires and the desires are not vague.
- To strengthen the self-reflection.
- To develop the commitment and courage to act.
- The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	1		2		2				1	3		
CO2	2	3	2	3		3		1				3	3		
CO3	2	2	3	1		1		3				2	3		
CO4	3	2	3	2		2		2				2	3		
CO5	2	2	2	1		2		1				3	3		
CO6	1	1	1	2		1		3				2	3		

UNIT I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration what is it? - Its content and process; and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' – happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the

harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health (Practice Exercises and Case Studies will be taken up in Practice Sessions)

UNIT III: Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-I)

Understanding Harmony in the family the basic unit of human interaction, Understanding values in human-human relationship; meaning of Justice (Nyaya) (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness (Ubhay-tripti); Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence

UNIT IV: Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-II)

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals (Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals), Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha), Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT V: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence, Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT VI: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

TEXT BOOK

1) R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2) R R Gaur, R Asthana, G P Bagaria, “Teachers Manual for a Foundation course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1) Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2) A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3) The Story of Stuff (Book).
4) Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5) E F Schumacher, "Small is Beautiful"
6) Slow is Beautiful – Cecile Andrews
7) J C Kumarappa "Economy of Permanence"
8) Pandit Sunderlal "Bharat Mein Angreji Raj"
9) Dharampal, "Rediscovering India"
10) Mohandas K Gandhi, "Hind Swaraj or Indian Home Rule"
11) India Wins Freedom – Maulana Abdul Kalam Azad
12) Vivekananda – Romain Rolland (English)
13) Gandhi – Romain Rolland (English)

In addition, the following reference books may be found useful for supplementary reading in Connection with different parts of the course:

1) B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co.,Lucknow. Reprinted 2008.
2) PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3) Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4) Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
5) Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6) Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7) A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8) E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9) A.N. Tripathy, 2003, Human Values, New Age International Publishers.

RELEVANT WEBSITES, MOVIES AND DOCUMENTARIES

1) Story of Stuff, http://www.storyofstuff.com
2) Al Gore, An Inconvenient Truth, Paramount Classics, USA
3) Charlie Chaplin, Modern Times, United Artists, USA
4) IIT Delhi, Modern Technology the Untold Story
5) Gandhi A., Right Here Right Now, Cyclewala Productions

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L	T	C
0	0	1

(A0094207) COMPREHENSIVE VIVA-VOCE

There shall be comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva Examination shall be conducted by the committee consisting of senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

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L	T	C
0	0	3

(A0095207) INDUSTRIAL / RESEARCH INTERNSHIP

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2

The student has to undergo research / industry internship in III year, II-Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the research / industry internship will be evaluated during 7th semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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L	T	C
0	0	1

(A0096208) TECHNICAL SEMINAR

COURSE OBJECTIVES:

- To understand the basic concepts of technical and practical issues of course specialization
- To import a well-organized report writing skill of technical writing

COURSE OUTCOMES:

At the end of the Seminar the students are able to:

- Identify and compare technical and practical issues related to the area of course specialization
- Outline annotated bibliography of research demonstrating scholarly skills
- Prepare a well-organized report employing elements of technical writing and critical thinking.
- Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	2	2	1	2	2	2	1	2	2	2	1
CO2	1	2	-	2	-	2	1	1	2	1	1	2	2	2	-
CO3	1	2	-	-	-	1	1	2	2	2	1	2	1	2	-
CO4	1	2	1	2	-	1	1	1	2	1	1	1	1	1	2

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L	T	C
0	0	5

(A0097208) INTERNSHIP IN INDUSTRY

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2

The student has to undergo 6 months internship in IV year, II-Semester for a complete period of 06 months in a reputed industry/organization. The finalization of the summer internship industry/organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the industry internship will be evaluated during 8^{th} semester which carries 05 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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L	T	C
0	0	6

(A0098208) PROJECT WORK

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2
CO5	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO6	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2

The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV year II semester. The external project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of one technical seminars (25 marks) and remaining 25 for main project related activities. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.