IV YEAR **I SEMESTER**

S. No.	Subject	T	P	Credits
1	Geotechnical Engineering-II	4	-	4
2	Design & Drawing of Irrigation Structures	4	-	4
3	Environmental Engineering	4	-	4
4	Remote Sensing and GIS Applications	4	-	4
5	**ELECTIVE–I** a) Earthquake Resistant Design b) Ground Improvement Techniques c) Urban Transportation Planning	4	-	4
6	**OPEN ELECTIVE** a) Air Pollution and Control b) Disaster Management c) Industrial Water & Waste Water Management d) Architecture and Town Planning	4	-	4
7	GIS and CAD Lab	-	3	2
8	Water and Wastewater Engineering Lab	-	3	2
	Total			28

IV YEAR **II SEMESTER**

S. No.	Subject	T	P	Credits
1	Estimation, Specifications & Contracts	4	-	4
2	**ELECTIVE – II** a) Advanced Structural Design b) Ground Water Development and Management c) Environmental Impact Assessment and Management	4	-	4
3	**ELECTIVE – III** a) Water Shed Management b) Finite Element Methods c) Pavement Analysis Design and Evaluation	4	-	4
4	**ELECTIVE – IV** a) Soil Dynamics and Machine Foundations b) Advanced Structural Analysis c) Water Resources System Planning and Management	4	-	4
5	Project Work	4	-	12
	Total			**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

GEOTECHNICAL ENGINEERING – II

UNIT – I

SOIL EXPLORATION: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests– Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

UNIT – II

SLOPE STABILITY: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions.

UNIT – III

EARTH PRESSURE THEORIES: Rankine's & Coulomb's theory of earth pressure, Rehbann's graphical method – Culmann's graphical method – Friction circle method - earth pressures in layered soils.

UNIT-IV

RETAINING WALLS: Types of retaining walls – Design approach of gravity retaining wall, cantilever retaining wall, bulk heads, anchored bulk heads

UNIT – V

SHALLOW FOUNDATIONS: Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity - Terzaghi, Meyerhof and Skempton and IS Methods

UNIT-VI

SHALLOW FOUNDATIONS – SETTLEMENT CRITERIA: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures - Settlement Analysis.

UNIT -VII

PILE FOUNDATION: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests – Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

UNIT-VIII

WELL FOUNDATIONS: Types – Different shapes of well – Components of well – functions – forces acting on well foundations - Design Criteria – construction and Sinking of wells – Tilt and shift.

TEXT BOOKS:

1. Das, B.M., - (2011) Principles of Foundation Engineering –6th edition (Indian edition) Cengage learning
2. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd, (2004).

REFERENCE BOOKS:

1. Bowels, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. Theory and practice of foundation design by N.N.SOM & S.C.DAS PHI Learning Private limited.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Design and drawing of

1. Surplus weir.
2. Tank sluice with a tower head
3. Canal drop-Notch type.
4. Canal regulator
5. Under tunnel
6. Syphon aqueduct type III.

Final Examination pattern: Any two questions of the above six designs may be asked out of which the candidate has to answer one question. The

duration of examination is three hours.

TEXT BOOKS:

1. Water resources engineering-principles and practice by C.Satyanarayana Murthy, New age International publishers.

REFERENCE BOOKS:

1. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard Book House.
2. Irrigation and water power engineering by B.C Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

ENVIRONMENTAL ENGINEERING

UNIT – I

Air Pollution – Sources of pollution – Effects on human beings – Air pollution Control Methods – Particulate control devices – General Methods of Controlling Gaseous Emissions – Air Emission standards.

UNIT – II

Special Treatment Methods – Adsorption – Reverse Osmosis – Defluoridation – Ion exchange – Ultra Filtration - Nitrification and Denitrification – Removal of Phosphates.

UNIT –III

Theories of industrial waste water management – Volume reduction – Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

UNIT – IV

Solid Waste Management – sources, composition and properties of solid waste – collection and handling – separation and processing - Solid waste disposal methods – Land filling – Incineration - Composting.

UNIT – V

Hazardous Waste – Nuclear waste – Biomedical wastes – Electronic wastes - Chemical wastes – Disposal and Control methods.

UNIT – VI

Noise Pollution – Effects of Noise, Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000

UNIT – VII

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, Melas and fares, Schools and Institutions, Rural Sanitation.

UNIT – VIII

Environmental Impact Assessment – Impact evaluation and analysis, EIA Methodologies, Assessment of Impacts on surface water, Air and biological Environments - Environmental audit, preparation of Environmental impact statement – Case studies.

TEXT BOOKS:

1. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
2. Environmental Engineering by Mackenzie L Davis & David A Cornwell by McGraw Hill Publishing.

REFERENCE BOOKS:

1. Physico –Chemical process for water quality control by Weber
2. Air Pollution and Control by M.N. Rao & H.N. Rao
3. Environmental Impact Assessment by Y. Anjaneyulu, BS Publications.
4. Environmental Engineering by Gerard Kiley, Tata McGraw Hill.
5. Social and Preventive Medicine by Park and Park.
6. Environmental Sanitation by KVSG Murali Krishna, Reem Publications, New Delhi.
7. Liquid waste of Industry by Nemerow
8. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
9. Environmental Engineering, 4th Edition by Ruth F. Weiner and Robin Matthews – Elesevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

REMOTE SENSING AND GIS APPLICATIONS

UNIT – I

INTRODUCTION TO REMOTE SENSING: Basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces.

UNIT – II

SENSORS AND PLATFORMS: introduction, passive sensor, active sensor, airborne remote sensing, spaceborne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential.

UNIT – III

IMAGE ANALYSIS: introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT – IV

GEOGRAPHIC INFORMATION SYSTEM: Introduction, key components, application areas of GIS, map projections.

UNIT- V

DATA ENTRY AND PREPARATION: spatial data input, raster data models, vector data models, raster versus vector.

UNIT – VI

SPATIAL DATA ANALYSIS: introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT – VII

RS AND GIS APPLICATIONS I: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.

UNIT – VIII

RS AND GIS APPLICATIONS II: Hydrology-flood zone delineation and mapping, groundwater prospects and recharge, reservoir storage estimation.

TEXT BOOKS:

1. Remote sensing and GIS by Basudeb Bhatta, Oxford University Press
2. Remote sensing and image interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc.
3. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

REFERENCE BOOKS:

1. Remote sensing by Robert A. Schowengerdt, Elsevier publishers.
2. Remote Sensing and its applications by LRA Narayana University Press 1999.
3. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
4. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU KAKINADA 2001, B.S.Publications.
5. GIS by Kang – tsung chang, TMH Publications & Co.,
6. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
7. Fundamental of GIS by Mechanical designs John Wiley & Sons.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

EARTHQUAKE RESISTANT DESIGN (ELECTIVE – I)

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, Epicenter etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India – Seismograms and Accelegrams.

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 – Concept of response spectrum.

UNIT – III

MULTI-DEGREE OF FREEDOM (MDOF) SYSTEMS: - Formulation of equations of motion – Free vibration –Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

UNIT – IV

EARTHQUAKE ANALYSIS : - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multi-storyed buildings – Use of response spectra.

UNIT – V

CODAL DESIGN PROVISIONS: - Review of the Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods –Displacements and drift requirements – Provisions for torsion.

UNIT – VI

CODAL DETAILING PROVISIONS: - Review of the Indian Seismic codes IS: 4326 and IS: 13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

UNIT – VII

SEISMIC PLANNING: - Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems– Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities –Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

UNIT – VIII

SHEAR WALLS: - Types – Design of Shear walls as per IS: 13920 – Detailing of reinforcements.

TEXT BOOKS:

1. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Prentice Hall of India, New Delhi.
2. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.
3. Earthquake Resistant Design of Structures by S.K.Duggal, Oxford university press.

REFERENCE BOOKS:

1. Dynamics of Structures – Clough & Penzien, McGraw Hill International Edition.
2. Earthquake Resistant Design of Structures by S.K.Duggal
3. Earthquake Tips by C.V.R.Murty, I.I.T. Kanpur.
4. Structural Dynamics by Mario Paaz.

IS Codes: IS: 1893, IS: 4326 and IS: 13920.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

GROUND IMPROVEMENT TECHNIQUES
(ELECTIVE –I)

UNIT – I

NEED & OBJECTIVES OF GROUND IMPROVEMENT TECHNIQUES.

DEWATERING: Sumps and interceptor ditches- single, multi stage well points - vacuum well points-Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis.

UNIT –II

GROUTING: Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage grouting hydraulic fracturing in soils and rocks- post grout test.

UNIT – III

IN-SITU DENSIFICATION METHODS IN GRANULAR SOILS: – Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.

UNIT - IV

IN-SITU DENSIFICATION METHODS IN COHESIVE SOILS: – preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

UNIT – V

STABILIZATION: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum, use of industrial wastes.

UNIT – VI

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

reinforced earth walls.

UNIT – VII

GEOSYNTHETICS: Geotextiles- Types, Functions, Properties and applications – geogrids and geomembranes – functions, properties and applications.

UNIT - VIII

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.

TEXT BOOKS:

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi

REFERENCES BOOKS:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons, New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

URBAN TRANSPORTATION PLANNING
(ELECTIVE –I)

UNIT – I

URBAN TAVEL DEMAND : Urban development - Urban transport problems - Urban travel characteristics - Need for planning - Urban travel demand - Trends - Overall planning process - Components of travel demand - Demand Function - Independent Variables - Travel Attributes - Assumptions in demand estimation - Sequential travel demand modeling - Simultaneous travel demand modeling - Study area - Cordon lines - Screen lines - Zoning.

UNIT – II

TRAVEL DEMAND SURVEYS : Data requirements for demand estimation - Highway network characteristics - Sampling methods - Home interview surveys - Road side interview surveys - Terminal surveys - Cordon surveys - Taxi surveys - Onboard surveys - Economic surveys - Data checking.

UNIT - III

TRIP GENERATION : Trip characteristics - factors influencing Trip productions and attractions - Trip rates - Zonal regression models - Category analysis - Personal trip generation models.

UNIT - IV

TRIP DISTRIBUTION : Factors influencing trip distribution - Growth factor mdthods - Trip length frequency diagram - Growth models - LP method - Opportunity models - Gravity opportunity model.

UNIT – V

MODE CHOICE ANAYSIS : Factors influencing passenger mode choice - Zonal regression models - Utility maximization - Discrete choice situation - Binary and Multinomial Logit models - Probability curves - Probit and nested Logit models.

UNIT – VI

TRAFFIC ASSIGNMENT : Need for Assignment - Objectives - Diversion curves - Shortest path Algorithms - All or nothing Assignment technique

- Capacity Restraint Assignment technique - Multi path Assignment technique - Link flows - Sufficiency and Deficiency analysis.

UNIT - VII

PLAN PREPARATION AND EVALUATION : Types of plans- conceptual plan, Master plan etc. - Short term planning vs Long term planning - Corridor Identification and Evaluation - Plan preparation - Evaluation techniques.

UNIT – VIII

MASS TRANSIT SYSTEMS : Need for Mass Transit systems - Role of Mass Transit in Urban Transport - Recommendations of Committee on urbanization & Alternate systems of UT - characteristics & Capacities of different MT systems - LRT, monorail, Metro, BRTS, etc.

TEXT BOOKS:

1. Kadiyali L.R - Traffic Engineering and Transportation Planning - Khanna Publishers, New Delhi.
2. Papacostas C.S. - Fundamentals of Transportation Engineering - Prentice Hall of India Pvt. Ltd; New Delhi.
3. John Khisty C - Transportation Engineering - An Introduction, Prentice Hall, Englewood Cliffs, New Jersey.
4. Nicholas J. Garber, A. Hoel, Raju Sarkar, Cengage learning, Principles of Traffic and Highway Engineering.

REFERENCE BOOKS:

1. Chari, S.R. UTP Lecture Notes - Regional Engg. College, Warangal.
2. Hutchinson, B.G. Introduction to Urban System Planning, McGraw Hill.
3. Mayer M and Miller E, Urban Transportation Planning: A decision oriented Approach, McGraw Hill.
4. Bruton, Urban Transportation Planning.
5. Dicky, Metropolitan Transportation Planning, DC Script Book Co.
6. Saxena, Traffic Planning and Design, Dhanpat Rai Publishers, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVECRSITY, KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

AIR POLLUTION AND CONTROL (OPEN ELECTIVE)

UNIT – I

Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Measurements of Pollution - Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

UNIT – II

Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains and Ozone Holes - Effects or art treasures.

UNIT-III

Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_2, NO_2, CO and HC - Air-fuel ratio. Computation and Control of products of combustion.

UNIT – IV

Meteorology and plume Dispersion; Properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity - Influence of Meteorological phenomena on Air Quality - Wind rose diagrams.

UNIT-V

Lapse Rates, Pressure Systems, Winds and moisture, Inversions and Plume behavior; Plume Rise Models; Gaussian Model for Plume Dispersion.

UNIT-VI

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Centrifugal separators – Reverse Flow Cyclones, Fabric filters – Bag House, Dry and Wet scrubbers, Efectrostatic precipitators.

UNIT – VII

General Methods of Control of NO_2 and SO_2 emissions – In-plant Control

Measures, process changes, dry and wet methods of removal and recycling.

UNIT – VIII

Ambient Air Quality Management – Monitoring of SPM, SO; NO and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring - Emission Standards.

TEXT BOOKS:

1. Air Pollution by M.N. Rao and H.V.N. Rao – Tata McGraw Hill Company.
2. Air Pollution and Control by KVSG Murali Krishna.

REFERENCE BOOKS:

1 An Introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air pollution by Wark and Warner - Harper & Row, New York.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

DISASTER MANAGEMENT
(OPEN ELECTIVE)

UNIT-I

DISASTER MANAGEMENT AN OVER VIEW: Introduction of DM – Inter disciplinary -nature of the subject – Hyogo frame of work of action (HFA) (2005-2015) – Five priorities for action.

UNIT-II

NATURAL HAZARDS AND DISASTER AND THEIR MANAGEMENT: Case study methods of the following: floods, droughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides.

UNIT-III

MAN MADE DISASTER AND THEIR MANAGEMENT ALONG WITH CASE STUDY METHODS OF THE FOLLOWING: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-IV

RISK AND VULNERABILITY: Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.

UNIT-V

ROLE OF TECHNOLOGY IN DISASTER MANAGEMENTS: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges-mitigation programme for earth quakes –flowchart , geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.

UNIT-VI

EDUCATION AND COMMUNITY PREPAREDNESS: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action

UNIT-VII

MULTI-SECTIONAL ISSUES: Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction.-Institutional capacity in disaster management -The Red cross and red crescent movement.-Corporate sector and disaster risk reduction-A community focused approach

UNIT-VIII

FIELD VISIT: Visit to a local area/site where natural or manmade hazard has occurred and prepare a report with the following details i) location of site ii) nature of the hazard(natural or manmade) iii) details of loss of life and property iv) response from the government/NGO etc. v) whether the response is adequate or not vi) the role of technology in risk reduction vii) suggestions for improvement of disaster response/preventive measures viii) conclusions

TEXT BOOKS:

1. Disaster management – Global challenges and local solutions. Edited by Rajib shah and R R Krishnamurthy(2009) published by universities press.
2. Disaster management – future challenges and oppurtutines(2007) editor by Jagbir singh. Published by I K international publishing house pvt.ltd.

REFERENCE BOOK:

1. Disaster management edited by H K Gupta (2003) published by universities press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

INDUSTRIAL WATER AND WASTE WATER MANAGEMENT
(OPEN ELECTIVE)

UNIT – I

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water requirements and treatment methods.

UNIT – II

Basic Theories of Industrial Wastewater Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems.

UNIT – III

Industrial waste water discharges into Streams, Lakes and oceans and problems, Land treatment - Recirculation of Industrial Wastes.

UNIT – IV

Use of Municipal waste water in Industries – Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Defluoridation, Removal of Iron and Manganese, Removal of Colour and Odour.

UNIT – V

Manufacturing Process and origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Special Characteristics, Effects and treatment methods.

UNIT – VI

Manufacturing Process and origin of liquid waste from Fertilizers, Distillers Dairy and Food Processing industries, Special Characteristics, Effects and treatment methods.

UNIT – VII

Manufacturing Process and origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT – VIII

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

TEXT BOOK:

1. Waste Water Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.

REFERENCE BOOKS:

1. Liquid waste of Industry by Nemerow.
2. Water and Waste Water Technology by Mark J. Hammer and Mark J. Hammer (Jr).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY : KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

ARCHITECTURE AND TOWN PLANNING
(OPEN ELECTIVE)

UNIT – I

HISTORY OF ARCHITECTURE: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles- Principle factors- Temple of Aihole, Mahabalipuram, Madurai, Deogarh, Bhuvaneshwar, Mount Abu. Indo Sarsanic Architecture: Mosque - Palace - Fort - Tomb.

UNIT – II

ARCHITECTURAL DESIGN: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT - III

PRINCIPLES OF PLANNING: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

UNIT - IV

POST-CLASSIC ARCHITECTURE: Introduction of post-classic architecture- contribution of eminent architects to modern period.

Brief summary of post-classic architecture – Indian and western architectural contribution of eminent architects: Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping, Vender Rohe, Caarihan, Nervi, Oscar Niemyer, Edward Durell Stone.

UNIT – V

HISTROICAL BACK GROUND OF TOWN PLANNING: Town planning in India – town plans of mythological Manasa – town plans of ancient Indian towns: Harappa, Mohenjodaro, Pataliputra, Vijayanagara, Delhi – Town plans of Egypt, Acropolis, Jerusalem, Mecca, Rome, Paris, London, New York, Istanbul.

UNIT – VI

MODERN TOWN PLANNING: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- Neighbourhood Planning.

UNIT - VII

STANDARDS OF TOWN PLANNING: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT – VIII

Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns- floating towns- sky scrapers-pyramidal cities.

REFERENCE BOOKS:

ARCHITECTURE

1. The great ages of World Architecture by G.K. Hiraskar.
2. Drafting and Design for Architecture by Hepler, Cengage Learning
3. Architect's Portable Handbook by John Patten Guthrie – McGraw.Hill International Publications.
4. Indian Architecture – Vol. I and II by Percy Brown, Taraporevala Publications, Bombay.
5. Planning and Design of Buildings – Section of Architecture by Y. S. Sane.
6. Mordern Ideal Homes for India by R. S. Deshpande.

TOWN PLANNING

1. Fundamentals of Town Planning – G.K.Haraskar.
2. Town and County Planning – A.J.Brown and H.M.Sherrard.
3. Town Design – Federik Glbbard, Architectural press, London.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

GIS AND CAD LABORATORY.

GIS:

SOFTWARES:

1. Arc GIS 9.0
2. ERDAS 8.7
3. Mapinfo 6.5

Any one or Equivalent.

EXCERCISES IN GIS:

1. Digitization of Map/Topsheet
2. Creation of thematic maps.
3. Study of features estimation
4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

COMPUTER AIDED DESIGN AND DRAWING:

SOFTWARE:

1. STAAD PRO / Equivalent/
2. STRAAP
3. STUDDS

EXCERCISIES:

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple tower Analysis and Design

TEXT BOOK:

1. Concept and Techniques of GIS by C.P.L.O. Albert, K.W. Yong, Prentice Hall Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. I-Sem.

WATER AND WASTEWATER ENGINEERING LAB.

LIST OF EXPERIMENTS

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness – Calcium & Magnesium.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides in water and soil.
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
11. Determination of C.O.D.
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive Coliform test.

NOTE: At least 10 of the above experiments are to be conducted.

LIST OF EQUIPMENTS

1) pH meter
2) Turbidity meter

3) Conductivity meter
4) Hot air oven
5) Muffle furnace
6) Dissolved Oxygen meter
7) U – V visible spectrophotometer
8) COD Reflux Apparatus
9) Jar Test Apparatus
10) BOD incubator
11) Autoclave
12) Laminar flow chamber
13) Hazen's Apparatus

TEXT BOOKS:

1. Standard Methods for Analysis of Water and Waste Water – APHA
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

REFERENCE BOOKS:

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

NOTE: The Conclusions of the experiment work done must be given after a thorough discussion of the result using Critical Analysis, Standards, Relavant Codes of practice, Range of Values, Applications, Suitability etc. with Quantitative expressions.

IV YEAR **II SEMESTER**

S. No.	Subject	T	P	Credits
1	Estimation, Specifications & Contracts	4	-	4
2	**ELECTIVE – II** a) Advanced Structural Design b) Ground Water Development and Management c) Environmental Impact Assessment and Management	4	-	4
3	**ELECTIVE – III** a) Water Shed Management b) Finite Element Methods c) Pavement Analysis Design and Evaluation	4	-	4
4	**ELECTIVE – IV** a) Soil Dynamics and Machine Foundations b) Advanced Structural Analysis c) Water Resources System Planning and Management	4	-	4
5	Project Work	4	-	12
	Total			**28**

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IV Year B.Tech. Civil Engineering. II-Sem.

ESTIMATING, SPECIFICATION AND CONTRACTS

PART-A

UNIT – I

General items of work in Building – Standard Units - Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT – II

Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-III

Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT – IV

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings.

UNIT – V

Standard specifications for different items of building construction.

PART-B

Detailed Estimates of Buildings using individual wall method & centre line method.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of part A and Part B. Part-A should consist of five questions and design out of which three are to be answered. Part -B consists of two questions and out of which one question is to be answered. Weightage for part –A is 60% and part –B is 40%

TEXT BOOKS

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie

REFERENCE BOOKS:

1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
4. National Building Code

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ADVANCED STRUCTURAL DESIGN
(ELECTIVE –II)

UNIT – I

Design of Retaining walls, cantilever and counter fort

UNIT – II

Design of RCC water tanks, Circular and rectangular types.

UNIT – III

Design of steel water tanks

UNIT - IV

Introduction to bunkers, silos and Chimney, concepts of loading and Design.

UNIT – V

Introduction to concrete bridges, IRC loading, slab bridges and T - beam bridges design concepts.

UNIT – VI

Design of plate girder railway bridges and gantry girders.

UNIT – VII

Design of steel truss bridges for railway loading

UNIT – VIII

Multistory building system -- detailing for Ductility, Design for earthquake and wind forces.

TEXT BOOKS:

1. Advanced Reinforced concrete structures by Varghese, Prentice Hall India.Pvt. Ltd.
2. Design drawing of concrete and steel structures by N.Krishna Raju University Press 2005.
3. Reinforced concrete structures Vol-2 by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

REFERENCE BOOKS:

1. Essentials of Bridge Engineering by D.Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. Reinforced concrete design by S.U. Pillai and D.Menon, Tata Mc.Ghrawhill Publishing Company

Codes: Relevant IS: codes.

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IV Year B.Tech. Civil Engineering. II-Sem.

GROUND WATER DEVELOPMENT AND MANAGEMENT
(ELECTIVE –II)

UNIT – I

INTRODUCTION

Ground Water Occurrence, formation properties affecting Ground water-porosity, Specific yield and Specific retention, permeability, transmissivity and storage coefficient. Differential equation governing ground water flow

UNIT – II

WELL HYDRAULICS

Unsteady radial flow into a well – Non-equilibrium equations – Theis solution – Jocob and Chow's methods, Leaky aquifers

UNIT – III

GEOPHYSICS

Surface and Subsurface Investigations: Surface methods of exploration – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications

UNIT – IV

WELL DESIGN

Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery

UNIT V

WELL CONSTRUCTION AND DEVELOPMENT

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT VI

ARTIFICIAL RECHARGE

Artificial Recharge of Ground Water: Concept of artificial recharge, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge

UNIT – VII

SEAWATER INTRUSION

Saline Water Intrusion: Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

UNIT – VIII

GROUNDWATER BASIN MANAGEMENT

Concepts-hydrologic equilibrium equation, basin management by conjunctive use.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.
3. Ground water assessment and development by KR Karanth

REFERENCE BOOKS:

1. Groundwater by Bower, John Wiley & sons.
2. Groundwater System Planning & Managemnet – R.Willes & W.W.G.Yeh, Prentice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributors.

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IV Year B.Tech. Civil Engineering. II-Sem.

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT (ELECTIVE –II)

UNIT – I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT – II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT – III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities.

UNIT-IV

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT – V

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT – VI

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT-VII

Post Audit activities, The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Mota Act, Wild life Act.

UNIT-VIII

Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, KAKINADA.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCE BOOKS:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K. Kataria & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. II-Sem.

WATER SHED MANAGEMENT
(ELECTIVE –III)

UNIT-I

INTRODUCTION: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

UNIT-II

CHARACTERISTICS OF WATERSHED: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-III

PRINCIPLES OF EROSION: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

UNIT-IV

MEASURES TO CONTROL EROSION: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-V

WATER HARVESTING: Rainwater Harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT-VI

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

UNIT-VII

ECOSYSTEM MANAGEMENT: Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping,cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, horticulture, social

forestry and afforestation.

UNIT-VIII

Planning of watershed management activities, people's participation, preparation of action plan, administrative requirements.

TEXT BOOKS:

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers.

REFERENCE BOOKS:

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Prentice Hall of India.

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IV Year B.Tech. Civil Engineering. II-Sem.

FINITE ELEMENT METHODS
(ELECTIVE –III)

UNIT -I

Introduction: Concepts of FEM, Steps involved, merits & demerits, energy principles, discretization, Rayleigh –Ritz method of functional approximation.

UNIT -II

Principles of Elasticity: Equilibrium equations, strain-displacement relationships, constitutive relationships for plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT -III

One Dimensional Elements: Stiffness matrix for bar element, shape functions for one dimensional elements, one dimensional problems.

UNIT –IV

Two Dimensional Elements: Different types of elements for plane stress and plane strain analysis, Displacement formulation, generalized coordinates, shape functions, convergent and compatibility requirements, geometric invariance, Natural coordinate system, area and volume coordinates, generation of element stiffness matrix and nodal load vector for 3-node triangular element and four node rectangular elements.

UNIT –V

Finite element formulation for Beams: Stiffness matrix, load vector, comparison of FE solution to exact solution.

UNIT –VI

Isoparametric formulation – Concepts of isoparametric elements for 2D analysis -formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

UNIT-VII

Axi-symmetric analysis- Basic principles-Formulation of 4-node iso-parametric axi-symmetric element

UNIT-VIII

Solution Techniques: Numerical Integration using Gauss quadrature, static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. Finite Element Methods in Engineering by Tirupati.R. Chandrupatla and AshokD. Belegundu - Pearson Education Publications.
2. A first course in the Finite element method by Daryl L. Logan, Cengage learning India

REFERENCE BOOKS:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. John Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Civil Engineering. II-Sem.

PAVEMENT ANALYSIS DESIGN AND EVALUATION
(ELECTIVE –III)

UNIT – I

MATERIAL SPECIFICATIONS:

Types of pavement Construction –MORTH specifications for construction of Gravel roads, WBM layers, bituminous pavement layers, CC pavements.

UNIT – II

PAVEMENT FAILURES

Causes of pavement failures – failures in flexible pavements – alligator cracking – consolidation of pavement failures – Shear failure – longitudinal cracking – frost leaving – reflection cracking – formation of waves and corrugation.

FAILURES IN CEMENT CONCRETE PAVEMENTS: factors – scaling of cement concrete – shrinkage cracks – spelling of joints – warping cracks – mud pumping – structural cracking.

UNIT – III

MAINTENANCE OF HIGHWAYS:

Routine maintenance – periodic maintenance – special repairs – maintenance of earth roads – maintenance of WBM roads – maintenance of bituminous surfaces – special repairs in flexible pavements – maintenance of CC roads – special repairs of CC pavements.

UNIT – IV

PAVEMENT EVALUATION:

Functional Evaluation of Pavements : Evaluation of pavement surface condition – pavement surface index – cracking – pot holes – rut depth etc.. – **Structural Evaluation of Pavements :** methods evaluation – static loading – Benkelman beam method – falling weight deflection (FWD) – impulse loading – dynamic cone penetration (DCP).

UNIT – V

STRENGTHENING OF EXISTING PAVEMENTS

Objectives – types of overlay – Design of overlay – flexible overlay over flexible pavement – Overlay design by Benkelman beam deflection studies – Rigid overlay over rigid pavement – Flexible overlay over rigid pavement – Rigid overlay over flexible pavement.

UNIT – VI

HIGHWAY DRAINAGE

Importance of highway drainage – requirements of highway drainage system – surface drainage – design of surface drainage system cross drainage – subsurface drainage – lowering of water table – control of seepage flow – control of capillary rise – design of subsurface drainage system.

UNIT – VII

PAVEMENT MANAGEMENT SYSTEM (PMS)

Need for PMS – Pavement deterioration models – HDM – Project level and network level management.

UNIT – VIII

ASSET MANAGEMENT (AM)

Need for AM – Concepts – Network management – Traffic management – safety management – Bridge management.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna & C.E.J.Justo, New chand & Bros., Roorke.
2. Text book of highway engineering, R. Srinivasa kumar,Universities press pvt. Ltd. 2011.
3. Highway engineering – LR Kadiyali and lal – khanna publishers.

REFERENCE BOOKS:

1. Highway engineering, Paul H. wright and Karen Dixon – John wiley & sons.

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IV Year B.Tech. Civil Engineering. II-Sem.

SOIL DYNAMICS AND MACHINE FOUNDATIONS
(ELECTIVE –IV)

UNIT – 1

Theory of vibrations: Basic definitions- free and forced vibrations with and without damping for single degree freedom system- Resonance and its effect – magnification – Logarithmic decrement – Transmissibility

UNIT – II

Natural frequency of foundation – Soil system: Barkan's and IS methods – pressure bulb concept – Pauw's Analogy.

UNIT – III

Wave propagation: one dimensional wave motion – propagation in an elastic infinite medium- wave propagation in an elastic half space – propagation of flexural waves in beams on elastic foundations

UNIT – IV

Dynamic Soil Properties: Field and Laboratory methods of determination – Uphole, Down hole and cross hole methods – Cyclic plate load test – Block vibration test – Determination of Damping factor.

UNIT – V

Dynamic response of foundations: Shallow and deep foundations – dynamic bearing capacity theory – codal provisions – dynamic response of deep foundations- dynamic testing of piles

UNIT – VI

Block foundation: Degrees of freedom - analysis under different modes of vibration- codal provisions for design and construction of foundations for reciprocating machine, impact type and rotary type

UNIT – VII

Seismic stability of slopes- analysis for stability of slopes- Swedish circle, friction circle, Newmark sliding block method- reliability of slopes of earth dam

Unit – VIII

Vibration Isolation: Generation and propagation of vibrations – basic concept of vibration isolation- base isolation- shock isolation- seismic isolation of bridges

TEXT BOOKS:

1. Soil Dynamics and earth quake of engineering- Bharat Bhushan Prasad, PHI publications
2. Advanced Soil Dynamics and earth quake of engineering- Bharat Bhushan Prasad, PHI publications

REFERENCE BOOKS:

1. Soil Dynamics by Shamsher Prakash
2. Vibration of soils and foundations by Richart, Hall and Woods, Prentice Hall.

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IV Year B.Tech. Civil Engineering. II-Sem.

ADVANCED STRUCTURAL ANALYSIS (ELECTIVE –IV)

UNIT - I

Introduction to theory of elasticity: Notations for forces and stresses, components of stresses, components of strains, Hooke's law.

UNIT – II

Plane stress and plane strain: Definitions, differential equations of equilibrium, boundary conditions, and compatibility equations.

UNIT - III

Two dimensional problems in rectangular co-ordinates: Airy stress function, solution by polynomials, saint venant principle, solution of bi-harmonic equation using Fourier series.

UNIT - IV

Two dimensional problems in polar co-ordinates: general equations in polar co-ordinates, solution of bi-harmonic equation for axial symmetry, general solution of bi-harmonic equation, bending of a curved bar, analysis of thick cylinder.

UNIT - V

Introduction to structural dynamics: Dynamic loadings, formulation of equation of motion – Newton's second law of motion, D'Alembert's principle, solution of undamped single degree of freedom system.

UNIT - VI

FREE VIBRATIONS: Damped single degree of freedom system, Viscous damping, equation of motion, critically damped, over damped and under damped system, logarithmic decrement.

UNIT - VII

FORCED VIBRATIONS: Response of one degree of freedom system to harmonic loading: undamped harmonic excitation, damped harmonic excitation, evaluation of damping at resonance, response to support motion.

UNIT - VIII

RESPONSE TO IMPULSIVE LOADING: Duhamel integral, numerical evaluation of Duhamel integral for undamped system.

TEXT BOOKS:

1. Mechanics of solids by Arbind Kumar Singh, Prentice-Hall of India, New Delhi.
2. Theory of Elasticity by Timoshenko and Goodier, McGraw Hill Book Company, New Delhi.
3. Structural Dynamics by Mario Paz, CBS Publishers, New Delhi.

REFERENCE BOOKS:

1. Theory of Elasticity by Sadhu Singh, Khanna Publishers.
2. Dynamics of structures by A. K. Chopra, Prentice Hall of India.

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IV Year B.Tech. Civil Engineering. II-Sem.

WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT (ELECTIVE -IV)

UNIT – I

INTRODUCTION: concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

UNIT – II

LINEAR PROGRAMMING –I: Formulation of linear programming models, graphical method, simplex method, application of Linear programming in water resources.

UNIT – III

LINEAR PROGRAMMING – II: Revised simplex method, duality in linear programming, sensitivity and past optimality analysis.

UNIT – IV

DYNAMIC PROGRAMMING: principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application for resource allocation.

UNIT – V

NON-LINEAR OPTIMATIZATION TECHNIQUES: Clerical of method optimization, Kuch-Tucleer, gradential based research techniques for simple unconstrained optimization.

UNIT – VI

SIMULATION: application of simulation techniques in water resources.

UNIT – VII

WATER–RESOURCES ECONOMICS: Principles of Economic analysis,

benefit-cost analysis socio economic intuitional and pricing of water resources.

UNIT – VIII

WATER RESOURCES MANAGEMENT: Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

TEXT BOOKS:

1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd. 2005.

2. Water Resources Economics - James & Lee. Oxford Publishers 2005.

REFERENCE BOOK:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.