

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech. C.E. I-Sem

L	T/P/D	C
4	-/-	4

**(57001) GROUND WATER DEVELOPMENT AND
MANAGEMENT
(ELECTIVE-II)**

UNIT - I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT - II

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT - III

Steady groundwater flow towards a well in confined and unconfined aquifers - Dupuit's and Theim's equations, Assumptions, Formation constants, yield of an open well Well interface and well tests - Recuperation Test.

UNIT - IV

Unsteady flow towards a well - Non equilibrium equations - Theis' solution - Jacob and Chow's simplifications, Leaky aquifers - Well Interference.

UNIT - V

Surface and Subsurface Investigation: Surface methods of exploration - Electrical resistivity and Seismic refraction methods. Subsurface methods - Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

UNIT - VI

Artificial Recharge of Ground Water: Concept of artificial recharge - recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

UNIT - VII

Well Construction - Drilling Equipment used for Well Construction - Bore log - Interpretation of Log Data.

UNIT - VIII

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCES :

1. Groundwater Hydrology by BOWER, John Wiley & sons.
2. Groundwater System Planning & Managemnet - R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.

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**(57002) ADVANCED STRUCTURAL DESIGN
(ELECTIVE-II)**

UNIT – I

Design and Detailing of Cantilever Types Retaining Walls – Principles of Counterfort Retaining Walls.

UNIT – II

Design of Circular Rectangular Water Tanks.

UNIT – III

Design of Bunkers and Silos.

UNIT – IV

Design of RCC Chimneys

UNIT – V

Design of Concrete Bridges – IRC Loading – Design of Slab Bridge.

UNIT – VI

Design of T-Beam Girder Bridge.

UNIT – VII

Design of Steel Bridges – Loadings – Design of Plate Girder Bridges.

UNIT – VIII

Design of Steel Gantry Girders.

TEXT BOOKS :

- Advanced Reinforced Concrete Structures by Vargheesh, Pranties Hall of India Pvt. Ltd.
- Reinforced Concrete Structures Vol. 2 by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, Publications Pvt. Ltd., New Delhi.

REFERENCES :

- Essentials of Bridge Engineering by D. John Son Victor, Oxford and IBM Publication Co., Pvt. Ltd.
- Reinforced Concrete Design by S.U. Pillai and D. Menon, Tata Mc. Grawhill Publishing Company.
Codes : Relevant IS : Codes.

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**(57003) ELEMENTS OF EARTHQUAKE ENGINEERING
(ELECTIVE-II)**

UNIT-I

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-strong ground motions- Seismic zones of India.

UNIT - II

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system-Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system-undamped and damped-critical damping-Logarithmic decrement-Forced vibrations.

UNIT – III

Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings- flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel - Lateral load resisting systems.

UNIT – IV

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT – V

Reinforced Concrete Buildings: Principles of earthquake resistant design of RC members- Structural models for frame buildings- IS code (IS 1893) based methods for seismic design- retrofitting- Vertical irregularities- Plan configuration problems- Determination of design lateral forces- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT – VI

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of

infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT – VII

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage- Isolation of non-structures.

UNIT – VIII

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Ductility-definition-ductility relationships-Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behaviour of beams and columns in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons
2. Masonry and Timber structures including earthquake Resistant Design –Anand S.Arya, Nem chand & Bros
3. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial college Press.
4. Advanced Reinforced Concrete Design – P. C Varghese. Prentice Hall of India Pvt. Ltd.
5. Earthquake Tips – Learning Earthquake Design and Construction C.V.R. Murty

REFERENCE CODES:

1. IS: 1893 (Part-1) -2002. "Criteria for Earthquake Resistant – Design of structures." B.I.S., New Delhi.
2. IS:4326-1993, "Earthquake Resistant Design and Construction of Building", Code of Practice B.I.S., New Delhi.
3. IS:13920-1993, "Ductile detailing of concrete structures subjected to seismic force" – Guidelines, B.I.S., New Delhi.

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(57004) WATERSHED MANAGEMENT (ELECTIVE-II)

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

Watershed delineation – Runoff Computations from a watershed – Flood Frequency Analysis – Gumbell, Log Pearson and Weibull Methods of Analysis.

UNIT-IV

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.

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

UNIT-V

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

UNIT-VI

FOREST AND GRASSLAND MANAGEMENT: Interpretation of Satellite Imageries- Land use and Land Cover. 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, Silvi pasture, horticulture, social forestry and afforestation.

UNIT-VIII

Planning of watershed management activities, peoples participation, preparation of action plan, administrative requirements- Reservoir Routing..

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:

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

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(57005) GIS AND REMOTE SENSING

UNIT - I

Introduction to Photogrammetry: Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height, determinations.

UNIT - II

Remote Sensing - I: Basic concepts and foundation of remote sensing - elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

UNIT - III

Remote Sensing - II: Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

UNIT - IV

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

UNIT - V

Types of data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS - File management, Spatial data - Layer based GIS, Feature based GIS mapping.

UNIT - VI

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT – VII

Water Resources Applications-I: Land use/Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics.

UNIT – VIII

Water Resources Applications – II: Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

TEXT BOOKS:

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

REFERENCES:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yongng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
3. GIS by Kang – tsung chang, TMH Publications & Co.,
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
5. Fundamental of GIS by Mechanical designs John Wiley & Sons.

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(57006) PAVEMENT DESIGN**UNIT – I**

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements

UNIT - III

Stress In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts

UNIT – IV

Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

UNIT – V

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

UNIT - VI

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations,

AASHTO, IRC Methods,

UNIT - VII

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT - VIII

Design of Pavement – Pavement design for low volume roads, Rural road designs – code of practices.

REFERENCES:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
3. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc
4. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
5. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
6. IRC Codes for Flexible and Rigid Pavements design

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(57007) ESTIMATING AND COSTING

UNIT - I

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

UNIT - II

Detailed Estimates of Buildings.

UNIT - III

Earthwork for roads and canals

UNIT - IV

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

UNIT - V

Reinforcement bar bending and bar requirement schedules.

UNIT-VI

Contracts – Types of contracts – Contract Documents – Conditions of contract.

UNIT - VII

Valuation of buildings.

UNIT - VIII

Standard specifications for different items of building construction.

TEXT BOOKS

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

REFERENCES :

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. Chakraborti; Laxmi publications.
4. National Building Code

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**(57010) DISASTER MANAGEMENT AND MITIGATION
(ELECTIVE-III)**

Unit-I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

Unit -II

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards -

Unit -III

Endogenous Hazards - Volcanic Eruption - Earthquakes - Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.

Unit -IV

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters, Infrequent events: Cyclones - Lightning - Hailstorms, Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation), Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves
Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation), Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Planetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion
Soil Erosion:— Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion, Chemical hazards/

disasters:— Release of toxic chemicals, nuclear explosion- Sedimentation processes, Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation, Biological hazards/ disasters:- Population Explosion.

Unit -V

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Unit -VI

Natural Disaster Reduction & Management

- a) Provision of Immediate relief measures to disaster affected people
- b) Prediction of Hazards & Disasters
- c) Measures of adjustment to natural hazards

Unit -VII

Disaster Management- An integrated approach for disaster preparedness, mitigation & awareness.

Mitigation- Institutions- discuss the work of following Institution.

- a. Meteorological observatory
- b. Seismological observatory
- c. Volcanology institution
- d. Hydrology Laboratory
- e. Industrial Safety inspectorate
- f. Institution of urban & regional planners
- g. Chambers of Architects
- h. Engineering Council
- i. National Standards Committee

Integrated Planning- Contingency management Preparedness -

- a) Education on disasters
- b) Community involvement
- c) The adjustment of Human Population to Natural hazards & disasters
Role of Media

Monitoring Management- Discuss the programme of disaster research & mitigation of disaster of following organizations.

- a) International Council for Scientific Unions (ICSU)- Scientific committee on problems of the Environment (SCOPE), International Geosphere- Biosphere programme (IGBP)
- b) World federation of Engineering Organizations(WFED)
- c) National Academy of Sciences
- d) World Meteorological organizations(WMO)
- e) Geographical Information System(GIS)
- f) International Association of Seismology & Physics of Earth's Interior (IASPEI)
- g) Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

Unit –VIII

- A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India
- Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters -Role of Panchayats in Disaster mitigations
- Environmental policies & programmes in India- Institutions & National Centres for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training

TEXT BOOK:

Disaster Mitigation: Experiences And Reflections by Pardeep Sahni

REFERENCES

- R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990
- Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997
- Kates, B.I & White, G.F The Environment as Hazards, oxford, New York, 1978
- R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
- H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
- R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
- Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003
- A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
- R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction, CSIR, New Delhi
- M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001

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(57011) ADVANCED FOUNDATION ENGINEERING**UNIT – I**

Introduction-Bearing capacity of Footings subjected to Eccentric and inclined loading – Meyerhoff's, Hansen's, Vesic theories – Foundations on layered soils.

UNIT - II

Elastic settlement of Footings embedded in sands and clays of Infinite thickness – Footings on soils of Finite thickness-Schmertamaunn's method, Janbu method.

UNIT – III

Pile Foundations – static and dynamic methods-pile groups-negative skin friction-under reamed piles.

UNIT – IV

Settlement of Pile groups resting in sands and clays –laterally loaded piles-ultimate capacity of laterally loaded piles.

UNIT – V

Lateral Earth pressures-Rankine - Coloumb's and graphical methods – Stability of cantilever and counterfort retaining walls, Reinforced earth retaining walls.

UNIT – VI

Cantilever sheet piles and anchored bulkheads, Earth pressure diagram - Determination of Depth of embedment in sands and clays – Timbering of trenches- Earth pressure diagrams – Forces in struts.

UNIT – VII

Caissons and well foundations: Types of caissons – well foundations - Different shapes of wells – Components of wells – functions and Design – Design Criteria – Sinking of wells – lateral stability by Terzaghi's analysis.

UNIT - VIII

Foundations in Expansive soils – Problems in Expansive soils – Mechanism of swelling–Swell Pressure and Swelling potential–Heave–foundation practices–Sand cushion–CNS technique – under – reamed pile Foundations – Granular pile – anchor technique, stabilization of expansive soils.

TEXT BOOKS:

- 1 Das, B.M., - (1999) Principles of Foundation Engineering –4th edition PWS Publishing, Singapore.
- 2 Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill International.
- 3 Geotechnical Engineering : Principles and practices of soil mechanics and foundation Engineering by VNS Murthy, Taylor & Francis Group

REFERENCE BOOKS:

- 1 Geotechnical Engineering by C. Venkataramah, NewAge International Pvt.Ltd, Publishers (2002).
- 2 Analysis and Design of Substructures – Swami Saran, Oxford & IBH Publishing Company Pvt.Ltd (1998).
- 3 Basics and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt.Ltd, Publishers (2002).

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(57601) CONCRETE AND HIGHWAY MATERIALS LAB**I. ROAD AGGREGATES:**

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.

III. CEMENT AND CONCRETES :**TESTS ON CEMENTS :**

1. Normal Consistency of fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity and soundness of cement.
4. Compressive strength of cement.
5. Workability test on concrete by compaction factor, slump and Vee-bee.
6. Young's modulus and compressive strength of concrete.
7. Bulking of sand.
8. Non-Destructive testing on concrete (for demonstration)

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(57602) ENVIRONMENTAL ENGINEERING LAB

LIST OF EXPERIMENTS

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids (Organic and Inorganic)
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination of iron.
6. Determination of Dissolved Oxygen.
7. Determination of Nitrates.
8. Determination of Optimum dose of coagulant
9. Determination of Chlorine demand
10. Determination of total Phosphorous.
11. Determination of B.O.D
12. Determination of C.O.D
13. Determination of Optimum coagulant dose.
14. Determination of Chlorine demand.
15. Presumptive coliform test.

NOTE : At least 8 of the above experiments are to be conducted.

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**(58001) GROUND IMPROVEMENT TECHNIQUES
(ELECTIVE-IV)**

UNIT – I

Dewatering: methods of de-watering- 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

Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

UNIT – VI

Geosynthetics : Description, properties, functions and applications of geosynthetics

UNIT – VII

Geoenvironmental application of geosynthetics : Geomembranes for landfills and ponds, Geosynthetic clay liner, Designing with GCL;s, Filtration, Erosion control, slope protection.