2007-2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

B.TECH. CIVIL ENGINEERING

III YEAR II SEMESTER

CODE.NO.	SUBJECT	T	P	C
	Geotechnical Engineering -I	4+1*	0	4
	Environmental Engineering-I	4+1*	0	4
	Design of Steel Structures	4+1*	0	4
	Water Resources Engineering–II	4+1*	0	4
	Estimating and Costing	4+1*	0	4
	Transportation Engineering	4+1*	0	4
	Geotechnical Engineering Lab	0	3	2
	Environmental Engineering Lab	0	3	2
TOTAL		**30**	**6**	**28**

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	4+1*	**0**	**4**

GEOTECHNICAL ENGINEERING - I

UNIT – I
INTRODUCTION: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density.

UNIT – II
INDEX PROPERTIES OF SOILS: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

UNIT –III
PERMEABILITY: Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting – laboratory determination of coefficient of permeability –Permeability of layered systems.

UNIT -IV
SEEPAGE THROUGH SOILS: Total, neutral and effective stresses –quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT – V
STRESS DISTRIBUTION IN SOILS: Boussinesq's and Wester gaard's theories for point loads and areas of different shapes – Newmark's influence chart .

UNIT – VI
COMPACTION: Mechanism of compaction – factors affecting – effects of compaction on soil properties. – Field compaction Equipment - compaction control.

UNIT – VII
CONSOLIDATION : stress history of clay; e-p and e-log p curves – magnitude and rate of 1-D consolidation – Terzaghi's Theory.

UNIT - VIII
SHEAR STRENGTH OF SOILS : Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays.

TEXT BOOKS:
1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New Delhi
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Soil Mechanics and Foundation by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

REFERENCES:
1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork.
3. Geotechnical Engineering by Purushotham Raj
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.

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ENVIRONMENTAL ENGINEERING – I

UNIT – I
Introduction : Waterborne diseases – protected water supply – Population forecasts, design period – water demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.

UNIT-II
SOURCES OF WATER : Comparison from quality and quantity and other considerations – intakes – infiltration galleries distribution systems. – requirements – methods and layouts.

UNIT III
Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants – feeding arrangements.

UNIT –IV
Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices- Miscellaneous treatment methods.

UNIT-V
Distribution systems -Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

UNIT VI
Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations. Design of sewers – shapes and materials – sewer appurtenances manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pumphouses – house drainge – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.

UNIT – VII
Layout and general out line of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters – standard and high rate.

UNIT-VIII
Construction and design of oxidation ponds - Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

TEXT BOOKS:
1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers

REFERENCS :
1. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.
2. Water and Waste Water Technology by Steel
3. Water and Waste Water Engineering by Fair Geyer and Okun
4. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
5. Waste water Engineering by Metcalf and Eddy.
6. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International

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DESIGN OF STEEL STRUCTURES

UNIT - I
Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of welds fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints, beam to beam and beam to Column connections.

UNIT – II
Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT –III
Tension members and compression members : General Design of members subjected to direct tension and bending – effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc.

UNIT – IV Design of Built up compression members – Design of lacings and battern. Design Principles of Eccentrically loaded columns splicing of columns.

UNIT – V
Design of Column Foundations: Design of sign of slab base and gusseted bases. Column bases subjected moment.

UNIT - VI
Roof Trusses: Different types of trusses – Design loads – Load combinations IS Code recommendations, structural details – Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

UNIT – VII
Plate Girder: Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates stiffeners – splicings and connections.

UNIT - VIII
Gantry girder impact factors - longitudinal forces, Design of Gantry girders.
Note: The students should prepare the following plates.
Plate 1 Detailing of simple beams
Plate 2 Detailing of Compound beams including curtailment of flange plates.
Plate 3 Detailing of Column including lacing and battens.
Plate 4 Detailing of Column bases – slab base and gusseted base
Plate 5 Detailing of steel roof trusses including particulars at joints.
Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

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

TEXT BOOKS
1. Design of Steel Structures by Ramachandra. Vol – 1, Universities Press. Hyderabad
2. Structural Design and Drawing by N.Krishna Raju; University Press, Hyderabad.
3. Design of steel structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi

REFERENCES
1. Comprehensive Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
2. Structural design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi
3. Design of Steel Structures by P.Dayaratnam; S. Chand Publishers
4. Design of Steel Structures by M.Raghupathi, Tata Mc. Graw-Hill

IS Codes:
1) IS -800 – 1984
2) IS – 875 – Part III
3) Steel Tables.
These codes and steel tables are permitted in the examinations.

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WATER RESOURCES ENGINEERING-II

UNIT-I
Diversion Head works: Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. Causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory, Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient, functions of U/s and d/s sheet piles.

UNIT-II
Canal structures I: types of falls and their location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall.

UNIT-III
Canal structures II: canal regulation works, principles of design of distributory and head regulators, canal outlets, types of canal modules, proportionality, sensitivity and flexibility.

UNIT-IV
Cross Drainage works: types, selection of site, design principles of aqueduct, siphon aqueduct and super passage.

UNIT-V
Types of dams, merits and demerits, factors affecting selection of type of dam, factors governing selecting site for dam, types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve.

UNIT-VI
Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage galleries.

UNIT-VII
Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage.

UNIT-VIII
Spillways: types of spillways, design principles of Ogee spillways, types of spillway gates.

TEXT BOOKS:
1. Irrigation engineering and hydraulic structures by S.K Garg, Khanna publishers.
2. Irrigation engineering by K.R.Arora
3. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers

REFERENCES:
1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
2. Concrete dams by Varshney.
3. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
4. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers

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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.

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 contigent 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. Chakraborthi; Laxmi publications.
4. National Building Code

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TRANSPORTATION ENGINEERING

UNIT I
HIGHWAY DEVELOPMENT AND PLANNING:
Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT – II
HIGHWAY GEOMETIC DESIGN:
Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Superelevation and Extra widening- Design of Transition Curves-Design of Vertical alignment- Gradients- Vertical curves.

UNIT – III
TRAFFIC ENGINEERING:
Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.

UNIT – IV
TRAFFIC REGULATION AND MANAGEMENT:
Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings-Design of Traffic Signals –Webster Method –IRC Method.

UNIT – V
INTERSECTION DESIGN:
Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelisation: Objectives –Traffic Islands and Design criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

UNIT – VI
INTRODUCTION TO RAILWAY ENGINEERING:
Permanent way components – Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density.

UNIT – VII
GEOMETRIC DESIGN OF RAILWAY TRACK:
Gradients- Grade Compensation- Cant and Negative Superelevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs .

UNIT – VIII
AIRPORT ENGINEERING:
Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

TEXT BOOKS:
1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7th edition (2000).
2. Railway Engineering – A text book of Transportation Engineering – S.P.chadula – S.Chand & Co. Ltd. – (2001).
3. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.
4.Airport Planning and Design- S.K.Khanna and Arora,Nemchand Bros.
REFERENCES:
1. Highway Engineering – S.P.Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)
2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna publications – 6th Edition – 1997.
3. Railway Engineering – August – Prabha & Co., 15th Edition – 1994.
4. Air Transportation Planning & design – Virendhra Kumar & Statish Chandhra – Gal Gotia Publishers (1999).

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GEOTECHNICAL ENGINEERING LAB

LIST OF EXPERIMENTS

1. Atterberg's Limits.
2. Field density-core cutter and sand replacement method
3. Grain size analysis
4. Permeability of soil, constant and variable head test
5. Compaction test
6. CBR Test
7. Consolidation test
8. Unconfined compression test
9. Tri-axial Compression test
10. Direct shear test.
11. Vane shear test

Any eight experiments may be completed.

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and Shrinkage limits
3. Field Density apparatus for
    a) Core cutter method
    b) Sand Replacement method

4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability Apparatus for
    a) Constant Head test
    b) Variable Head test
7. Universal Auto compactor for I.S light and heavy compaction tests.
8. Apparatus for CBR test
9. Sampling tubes and sample extractors.
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Tri-axial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot Air ovens (Range of Temperature 50-150^{0}C
16. Moisture cans – 2 dozens.
17. Electronic balances pf 500 g capacity with 0.01g least count and 5 kg capacity with least count of 1gm
18. Measuring Jars - 1000CC - 6
    - 100CC - 4
19. Mercury - 500 g
20. Rammers - 2
    Crow bars - 2

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	0	**3**	**2**

ENVIRONMENTAL ENGINEERING LAB.

LIST OF EXPERIMENTS

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

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

LIST OF EQUIPMENT

1) pH meter,
2) Tabidity meter,
3) Conductivity meter,
4) Hot air oven,
5) Muffle furnace,
6) Dissolved Oxygen meter,
7) U – V visible spectrophotometer,
8) Reflux Apparatus,
9) Jar Test Apparatus,
10) BOD incubator.

TEXT BOOKS:

1. Chemistry for Environmental Engineering by Sawyer and Mc. Carty
2. Standard Methods for Analysis of water and Waste Water – APHA

REFERENCE

1. Relevant IS Codes.