

VI SEMESTER  
ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

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Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water

standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

**WATER TREATMENT:** Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2

Hours

**SEDIMENTATION:** Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clariflocculator.

4

Hours

#### Part - B

Unit - 5

**FILTRATION:** Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

Unit - 6

**DISINFECTION:** Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4

Hours

**SOFTENING** – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

Unit - 7

**MISCELLANEOUS TREATMENT:** Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

**DISTRIBUTION SYSTEMS:** System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

Unit - 8

MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.

2

Hours

TEXT BOOKS:

1. Water supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, New Delhi

**REFERENCES**

1. Hammer, M.J., (1986), **Water and Wastewater Technology** –SI Version, 2nd Edition, John Wiley and Sons.
2. Karia, G.L., and Christian, R.A., (2006), **Wastewater Treatment – Concepts and Design Approach**, Prentice Hall of India Pvt. Ltd., New Delhi.
3. Metcalf and Eddy, (2003), **Wastewater Engineering, Treatment and Reuse**, 4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.
4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), **Environmental Engineering**–Mc Graw Hill Book Co.
5. Raju, B.S.N., (1995), **Water Supply and Wastewater Engineering**, Tata McGraw Hill Pvt. Ltd., New Delhi.
6. Sincero, A.P., and Sincero, G.A., (1999), **Environmental Engineering – A Design Approach**–Prentice Hall of India Pvt. Ltd., New Delhi.

## **DESIGN & DRAWING OF RC STRUCTURES**

Subject Code	: <b>10CV62</b>	IA Marks	: 25
No. of Lecture	: 02 (T) +03 (D)	Exam Hours	: 04
Hours/Week			
Total No. of Lecture	: 26 (T) + 39 (D)	Exam Marks	: 100
Hours			

### **PART - A**

#### **UNIT-1**

Layout Drawing: General layout of building showing, position of columns, footings, beams and slabs with standard notations.

#### **UNIT-2**

Detailing of Beam and Slab floor system, continuous beams.

#### **UNIT-3**

Detailing of Staircases: Dog legged and Open well.

#### **UNIT-4**

Detailing of Column footings: Column and footing (Square and Rectangle).

**13 (T) + 18 (D)**

### **PART - B**

#### **UNIT-5**

Design and detailing of Rectangular Combined footing slab and beam type.

#### **UNIT-6**

Design and detailing of Retaining walls (Cantilever and counter fort type).

#### **UNIT-7**

Design and detailing of Circular and Rectangular water tanks resting on ground and free at top (Flexible base and Rigid base), using IS: 3370 (Part IV) only.

#### **UNIT-8**

Design and detailing of Simple Portal Frames subjected to gravity loads. (Single bay & Single storey)

**13 (T) + 21 (D)**

#### **REFERENCE BOOKS:**

1. **Structural Design & Drawing Reinforced Concrete & Steel**- N. Krishnaraju, University Press.

2. **Structural Design and Drawing**- Krishnamurthy -, (Concrete Structures), CBS publishers, New Delhi. Tata Mc-Graw publishers.
3. **Reinforced Concrete Structures** - B.C. Punmia – Laxmi Publishing Co.
4. **Reinforced Concrete Design** – S.N.Sinha, McGrawHill Education,

#### **SCHEME OF QUESTION PAPER:**

**Part A :** Three questions each carrying 20 marks is to be set. Student has to answer two questions out of three.

**Part B:** Two questions each carrying 60 marks is to be set. Student has to answer one question out of two.

#### **TRANSPORTATION ENGINEERING II**

Subject Code	: 10CV63
I A Marks	:25
No. of lecture Hours/week	:04
Exam Hours	:03
Total No. of Lecture Hours	:52
Exam Marks	:100

#### **PART – A** **RAILWAY ENGINEERING**

##### **UNIT – 1**

**INTRODUCTION:** Role of railways in transportation, Indian Railways, Selection of Routes, Permanentway and its requirements, Gauges and types, Typical cross sections-single and double line B G track in cutting, embankment and electrified tracks, Coning of wheels and tilting of rails, **Rails**-Functions-requirements—types and sections-length-defects-wear-creep-welding-joints, creep of rails

**06 Hrs**

##### **UNIT – 2**

**SLEEPERS AND BALLAST:** Functions, requirements, Types, Track fitting and fasteners-Dog spike, screw spike and Pandrol clip,-Fish plates-bearing plates, Calculation of quantity of materials required for laying a track-Examples, **Tractive resistances** and hauling capacity with examples

**06Hrs**

UNIT – 3

**GEOMETRIC DESIGN:** Necessity, Safe speed on curves, **Cant-cant** deficiency-negative cant-safe speed based on various criteria,(both for normal and high speed tracks) Transition curve, Gradient and types, grade compensation, Examples on above.

**06 Hrs**

UNIT – 4

**POINTS AND CROSSING:** Components of a turnout, Details of Points and Crossing, Design of turnouts with examples (No derivations) types of switches, crossings, track junctions Stations and Types, Types of yards, Signalling-Objects and types of signals, station and yard Equipment-Turn table, Fouling mark, buffer stop, level crossing, track defects, and maintenance.

**08 Hrs**

**PART – B**  
**AIRPORT ENGINEERING**

UNIT – 5

**INTRODUCTION:** Layout of an airport with component parts and functions, Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind rose with examples

**06 Hrs**

UNIT – 6

**RUNWAY-** Basic runway length-Corrections and examples, Runway geometrics, **Taxiway**-Factors affecting the layout - geometrics of taxiway-Design of exit taxiway with examples, **Visual aids-** Airport marking – lighting-Instrumental Landing System.

**06 Hrs**

**TUNNEL ENGINEERING**

UNIT – 7

**TUNNELS:** Advantages and disadvantages, Size and shape of tunnels, Surveying-Transferring centre line, and gradient from surface to inside the tunnel working face, Weisbach triangle-Examples, Tunnelling in rocks-methods, Tunnelling methods in soils-Needle beam, Liner plate, Tunnel lining, Tunnel ventilation, vertical shafts, Pilot tunneling, mucking and methods, drilling and drilling pattern.

**06Hrs**

## UNIT – 8

**HARBOURS:** Harbour classifications, Layout with components, Natural phenomenon affecting the design of harbours - wind, wave and tide, currents, Breakwater-Types Wharf and Quays, Jetties and Piers, Dry dock and wet docks, Slipways, Navigational aids, warehouse and transit-shed.

**08 Hrs**

### TEXT BOOKS

1. **Railway Engineering** - Saxena and Arora, Dhanpat Rai & Sons, New Delhi
2. **Indian Railway Track** – M M Agarwal, Jaico Publications, Bombay
3. **Airport Planning and Design** – Khanna Arora and Jain, Nem Chand Bros, Roorkee
4. **Docks and Tunnel Engineering** – R Srinivasan, Charaotar Publishing House
5. **Docks and Harbour Engineering** –H P Oza and G H Oza Charaotar Publishing House
6. **Surveying** – B C Punmia, Laxmi Publications

### REFERENCE BOOK

1. **Railway Engineering** – Mundrey, McGraw Hill Publications

## GEOTECHNICAL ENGINEERING – II

Subject Code	: <b>10CV64</b>	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

### PART - A

#### UNIT - 1

**SUBSURFACE EXPLORATION:** Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of geophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

**DRAINAGE AND DEWATERING:** Determination of ground water level by Hvorslev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

**8 Hours**

**UNIT - 2**

**STRESSES IN SOILS:** Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and Westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

**6**

**Hours**

**UNIT - 3**

**FLOWNETS:** Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

**5 Hours**

**UNIT - 4**

**LATERAL EARTH PRESSURE:** Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories—assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

**7 Hours**

**PART - B**

**UNIT - 5**

**STABILITY OF EARTH SLOPES:** Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellenius method.



**UNIT - 6**

**BEARING CAPACITY:** Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test.

**8 Hours**

**UNIT - 7**

**FOUNDATION SETTLEMENT:** Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

**5 Hours**

**UNIT – 8**

**PROPORTIONING SHALLOW AND PILE FOUNDATIONS**

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity, Proportioning pile foundation.

**6 Hours**

**TEXT BOOKS:**

1. **Soil Engineering in Theory and Practice-** Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.-** Punmia B.C. (2005), 16<sup>th</sup> Edition Laxmi Publications Co. , New Delhi.

**REFERENCES BOOKS:**

1. **Foundation Analysis and Design-** Bowles J.E. (1996), 5<sup>th</sup> Edition, McGraw Hill Pub. Co. New York.

2. **Soil Mechanics and Foundation Engineering-** Murthy V.N.S. (1996), 4<sup>th</sup> Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics-** Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., New Delhi.
4. **Geotechnical Engineering-** Venkatrahmaiah C. (2006), 3<sup>rd</sup> Edition New Age International (P) Ltd., New Delhi.
5. **Soil Mechanics-** Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering-** Braja M. Das (2002), 5<sup>th</sup> Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering-** Iqbal H. Khan (2005), 2<sup>nd</sup> Edition, PHI, India.

## **HYDRAULIC STRUCTURES & IRRIGATION DESIGN-DRAWING**

Subject Code	: <b>10CV65</b>	IA Marks	: 25
No. of Lecture Hours/Week	: 02+03	Exam Hours	: 04
Total No. of Lecture Hours	: 25+40	Exam Marks	: 100

### **PART-A**

#### **Hydraulic Structures**

##### **Unit1: Reservoir Planning**

Introduction, classification of Reservoirs, Storage zones of a reservoir, Mass curve, fixing capacity of a reservoir, safe yield, problems, density currents, Trap efficiency, Reservoir sedimentation, life of a reservoir, economic height of a dam, problems. environmental effects of reservoirs, **6 hours**

##### **Unit2: Gravity Dams**

Introduction, forces on a gravity dam, stress analysis in gravity dam, Problems, combination of forces for design. Elementary & practical profiles of a gravity dam, stability analysis (without earth quake forces), problems, galleries in gravity dams,

**7 hours**

##### **Unit3: Earth Dams**

Introduction, types of Earth dams, construction methods, Design criteria for Earth dams, causes of failure of earth dams, section of dam, preliminary design criteria, problems, control of seepage through earth dams, Safety measures.

**6 hours**

##### **Unit4: Spillways**

Introduction, essentials of a spillway, spillway components, factors affecting type & design of spillways. Ogee spillway ( simple design problems ). Energy dissipation below spillways ( hydraulic jump- No design ). **6 hours**

## **PART-B**

### **Irrigation Design- Drawing**

**Design and Drawing with all the three views of :**

1. Surplus weir with stepped apron
2. Tank Plug sluice without tower head
3. Canal gate sluice without tower head
4. Notch type Canal Drop
5. Canal Cross regulator.
6. Aqueduct (Hydraulic Design only)

**40 hours**

Text Books:

1. Text book of irrigation engineering & Hydraulic Structures- R.K.Sharma, Oxford & IBH publishing Co., New Delhi ( 2002)
2. Irrigation & Water resources engineering- G.L.Asawa, New Age International Publishers, New Delhi ( 2005)
3. Irrigation, Water Resources & Water power engineering- Modi . P.N., Standard Book House, New Delhi
4. Design of minor irrigation and Canal structures- C. Sathya Narayana Murthy, Wiley eastern limited, New Delhi (1990)

Reference Books:

1. Irrigation engineering & Hydraulic structures- Garg.S.K., khanna publishers, New Delhi
2. Hydraulic Structures & Irrigation Design Drawing - Dr.N.Balasubramanya, Tata Mcgraw-Hill Education Pvt.Ltd., New Delhi
3. Irrigation and Water Power Engineering- Madan Mohan Das & Mimi Das Saikia, PHI Learning Pvt. Ltd., New Delhi (2009)

### **Question paper pattern:**

**Four** questions are to be set from Part A of which **Two** full questions are to be answered for 40 marks

**Two** questions are to be set from Part B of which **one** full question is to be answered for 60 marks ( 25 marks for design + 35 marks for two views )

### **THEORY OF ELASTICITY**

Subject Code	: <b>10CV661</b>	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

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#### **PART - A**

##### **UNIT -1**

Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, Generalised Hooke's Law, Strain- displacement relations, St. Venant's principle

**5  
Hours**

##### **UNIT - 2**

Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials – for Two Dimensional cases only.

**8  
Hours**

##### **UNIT- 3**

Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, Mohr's circle of stress and strain, analytical method.

**4 Hours**

##### **UNIT - 4**

Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, Simply supported beam subjected to UDL.

**10  
Hours**

## **PART - B**

### **UNIT - 5**

Two-dimensional problems in polar coordinates, strain-displacement relations, equations of equilibrium, compatibility equation, stress function.

**8  
Hours**

### **UNIT - 6**

Axi Symmetric stress distribution - Rotating discs, Lamé's equation for thick cylinder.

**5  
Hours**

### **UNIT- 7**

Effect of circular hole on stress distribution in plates subjected to tension, compression and shear, stress concentration factor.

**7  
Hours**

### **UNIT - 8**

Torsion: Inverse and Semi-inverse methods, stress function, torsion of circular and elliptical sections.

**5 Hours**

### **TEXT BOOKS:**

1. **"Theory of Elasticity" - International Students-** Timoshenko. S.P. and Goodier. J.N. - Edition, McGraw Hill Book Co. Inc., New Delhi.
2. **Applied Elasticity-** Wang. P.C.

### **REFERENCE BOOKS:**

1. **Contium Mechanics Fundamentals-** Valliappan. C : Oxford and IBH Publishing Co. Ltd., New Delhi.
2. **Advanced Mechanics of Solids-** Srinath.L.S. : Tata McGraw Hill Publications Co.Ltd., New Delhi.
3. **Structural Mechanics with Introduction to Elastity and Plasticity-** Venkataraman and Patel : McGraw Hill Book Inc., New York.
4. **Mechanics of Solids-** Arbind Kumar Singh : Prentice hall of India Pvt. Ltd. New Delhi -2007.

## ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	: 10CV662	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

### PART - A

#### UNIT - 1

##### INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

**6 Hours**

#### UNIT - 2

##### ALTERNATIVE BUILDING MATERIALS:

1. Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block

**6 Hours**

#### UNIT - 3

##### LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes

14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

**6  
Hours**

#### **UNIT - 4**

##### **ALTERNATIVE BUILDING TECHNOLOGIES**

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

**8 ours**

#### **PART - B**

#### **UNIT - 5**

##### **STRUCTURAL MASONRY**

1. Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

**6  
Hours**

#### **UNIT - 6**

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

**8  
Hours**

## **UNIT - 7**

### **COST EFFECTIVE BUILDING DESIGN**

1. Cost concepts in buildings
2. Cost saving techniques in planning, design and construction
3. Cost Analysis : Case studies using alternatives.

**6 Hours**

## **UNIT - 8**

### **EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS**

1. Machines for manufacture of concrete
2. Equipments for production of stabilized blocks
3. Moulds and methods of production of precast elements.

**6  
Hours**

### **TEXT BOOKS:**

1. **Alternative building methodologies for engineers and architects, lecture notes edited:** K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of science, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

### **REFERENCE BOOKS:**

1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology, 19<sup>th</sup> to 20<sup>th</sup> December 2003 @ BVB College of Engineering. & Tech., Hubli.**



## GROUND IMPROVEMENT TECHNIQUES

Subject Code	: 10CV663	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

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### PART - A

#### UNIT - 1

**GROUND IMPROVEMENT:** Definition, Objectives of ground improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. Ground modification for Black Cotton soil

4

**Hours**

#### UNIT - 2

**COMPACTION:** Effect of grain size distribution on compaction for various soil types like lateritic soil, coarse-grained soil and micaceous soil. Effect of compaction on engineering behaviour like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction. Shallow and deep compaction, Dynamic Compaction, Vibrofloatation.

8 Hours

#### UNIT - 3

**HYDRAULIC MODIFICATION:** Definition, Principle and techniques. gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering.

6

Hours

#### UNIT - 4

**DRAINAGE & PRELOADING:** Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.

6

**Hours**

## **PART - B**

### **UNIT - 5**

**CHEMICAL MODIFICATION-I:** Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash.

**6**

**Hours**

### **UNIT - 6**

**CHEMICAL MODIFICATION-II:** Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

**6**

**Hours**

### **UNIT - 7**

**GROUTING:** Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.

**6**

**Hours**

### **UNIT - 8**

**MISCELLANEOUS METHODS (ONLY CONCEPTS & USES):** Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micropiles.

**8**

**Hours**

#### **TEXT BOOKS:**

1. **Ground Improvement Techniques-** Purushothama Raj P. (1999) Laxmi Publications, New Delhi.
2. **Construction and Geotechnical Method in Foundation Engineering-** Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.

#### **REFERENCE BOOKS:**

1. **Engineering principles of ground modification-** Manfred Hausmann (1990) - Mc Graw Hill Pub. Co., New York.

2. **Methods of treatment of unstable ground-** Bell, F.G. (1975) Butterworths, London.
3. **Expansive soils-** Nelson J.D. and Miller D.J. (1992) -, John Wiley and Sons.
4. **Soil Stabilization; Principles and Practice-** Ingles. C.G. and Metcalf J.B. (1972) - Butterworths, London.

### ADVANCED SURVEYING

Subject Code	:10CV664	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

### PART - A

#### UNIT - 1

##### **THEORY OF ERRORS AND TRIANGULATION ADJUSTMENT:**

Errors and classification of errors Precision and accuracy, Laws of weights and accidental errors.

5

**Hours**

#### UNIT - 2

**PROBABILITY:** Probability distribution function and density function-normal distribution. RMS error-measure of precision. Rejection of observations-principles of least squares-Normal equations.

6

**Hours**

#### UNIT - 3

**METHOD OF CORRELATES:** Triangulation adjustment. Angle adjustment, station adjustment and figure adjustment.

6

**Hours**

#### UNIT - 4

**ELECTRONIC DISTANCE MEASUREMENT (EDM):** Introduction, Electro Magnetic (EM) Waves. Phase comparison and modulations. Instruments – Geodimeter – Tellurimeter – Distomat – Range finders – Radars. Introduction to GPS Total station.

8

**Hours**

## PART - B

### UNIT - 5

**FIELD ASTRONOMY:** Earth celestial sphere. Solar system Position by altitude and azimuth system-spherical triangle and spherical trigonometry. Astronomical triangle. Nepiers rule.

8

Hours

### UNIT - 6

**TIME:** Siderial time, day and year-solar time and day-Greenwich mean time-standard time. Meridian and azimuth-their determination-latitude and its determination.

6

Hours

### UNIT - 7

**HYDROGRAPHIC SURVEYING:** Methods of soundings. Instruments. Three point problem. Tidal and Stream discharge measurement

7

Hours

### UNIT - 8

**SETTING OUT WORKS:** Introduction. Setting out of buildings, culverts, bridge, pipeline and sewers, tunnels.

6

Hours

### TEXT BOOKS:

1. **Surveying Vol I, II & III-** Punmia. B.C. - Lakshmi Publications, New Delhi.
2. **Surveying Vol I & II-** Duggal S.K. - Tata Mc Graw-Hill publishing Co.,
3. **Surveying Levelling-Part I & II** – Kanitkar T.P. & Kulkarni S.V. – Pune Vidhyarthi Gruha Prakashana.

### REFERENCE BOOKS:

1. **Introduction to Surveying-** James, M. Anderson and Edward, M. Mikhail – Mc Graw Hill Book Co., 1985.
2. **Analysis and survey measurements-** M. Mikhailil and Gracie, G. - Van Nostrand Reinhold Co., (NY)-1980.
3. **Plane and Geodetic Surveying for Engineers** - David Clark -Vol I & II-CBS publishers and distributors, New Delhi.

## GROUND WATER HYDROLOGY

Subject Code	: 10CV665	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

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### PART - A

#### UNIT - 1

**INTRODUCTION:** Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

**6 Hours**

#### UNIT - 2

**AQUIFER PROPERTIES:** Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

**6 Hours**

#### UNIT - 3

**DARCY'S LAW AND HYDRAULIC CONDUCTIVITY:** Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

**7 Hours**

#### UNIT - 4

**WELL HYDRAULICS – STEADY FLOW:** Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

**7 Hours**

### PART - B

#### UNIT - 5

**WELL HYDRAULICS – UNSTEADY FLOW:** Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

**7 Hours**

#### **UNIT - 6**

**GROUND WATER DEVELOPMENT:** Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

**7 Hours**

#### **UNIT - 7**

**GROUND WATER EXPLORATION:** Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

**6 Hours**

#### **UNIT - 8**

**GROUND WATER RECHARGE AND RUNOFF:** Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

**6 Hours**

#### **TEXT BOOKS:**

1. **Ground Water-** H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology-** K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology-** A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

#### **REFERENCE BOOKS:**

1. **Ground Water Hydrology-** Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells-** Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation-** W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.
4. **Water wells and Pumps** – Michel D.M., Khepar. S.D., Sondhi. S.K., McGraw Hill Education – 2<sup>nd</sup> Edition.

## RURAL WATER SUPPLY AND SANITATION

Subject Code	:10CV666	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

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### Part - A

#### UNIT - 1

RURAL WATER SUPPLY: Introduction: Need for a protected water supply, investigation and selection of water sources, water borne diseases, protection of well water, drinking water quality standards.

6

Hours

#### UNIT - 2

Types of pumps, supply systems viz., BWS MWS, PWS, water treatment methods – disinfection, defluoridation, hardness and iron removal, ground water contamination and control.

6

Hours

#### UNIT - 3

RURAL SANITATION: public latrine, concept of Eco-sanitation, trenching and composting methods, Two pit latrines, aqua privy, W.C, septic tank, soak pit.

8

Hours

#### UNIT - 4

DRAINAGE SYSTEMS: Storm water and sullage disposal, rain water harvesting and uses.

3

Hours

### Part - B

#### UNIT - 5

COMMUNICABLE DISEASES: Terminology, classifications, methods of communication, general methods of control.

4 Hours

#### UNIT - 6

REFUSE COLLECTION AND DISPOSAL: collection methods, transportation, disposal – salvaging, dumping, manure pits, dumping in low lands , composting, dung disposal – digester, biogas plant.

10

Hours

**UNIT - 7**

MILK SANITATION: Essentials, test for milk quality, pasteurization, quality control, cattle borne diseases, planning for a cow shed.

9

Hours

**UNIT - 8**

INSECT CONTROL: House fly and mosquito – life cycle, diseases, transmission and control measures.

6

Hours

**TEXT BOOKS:**

1. Environmental Sanitation - Joseph. A. Solveto
2. Water Supply & Sanitary Engineering - E.W.Steel

**REFERENCE BOOK:**

1. Preventive & Social Medicine - Park & Park

**TRAFFIC ENGINEERING**

Subject Code	: <b>10CV667</b>	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

**PART - A**

**UNIT - 1**

**INTRODUCTION:** Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

2

Hours

**UNIT - 2**

**TRAFFIC CHARACTERISTICS:** Road user characteristics, vehicular characteristics – static and dynamic characteristics, power



performance of vehicles, Resistance to the motion of vehicles –  
Reaction time of driver – Problems on above.

6

**Hours**

**UNIT - 3**

**TRAFFIC STUDIES:** Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6

**Hours**

**UNIT - 4**

**INTERPRETATION OF TRAFFIC STUDIES:** Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

**6 Hours**

**PART - B**

**UNIT - 5**

**TRAFFIC FLOW THEORIES:** Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

**8 Hours**

**UNIT - 6**

**STATISTICAL ANALYSIS:** Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

**12 Hours**

**UNIT - 7**

**TRAFFIC REGULATION AND CONTROL:** Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10

**Hours**

## UNIT - 8

**INTELLIGENT TRANSPORT SYSTEM:** Definition, Necessities, Application in the present traffic scenario

**2**

### Hours

#### TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali-Khanna Publishers.
2. **Highway Engineering Nemchand & Bros-** Khanna & Justo-Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

#### REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering-** Jotin Khistey and Kentlal- PHI.
4. **Traffic Engineering-** Mc Shane & Roess- PHI.

## GEOTECHNICAL ENGINEERING LABORATORY

Subject Code	: <b>10CVL67</b>	IA Marks	: 25
No. of Practical	: 03	Exam Hours	: 03
Hours/Week			
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. Identification of gravel type, sand type, silt type and clay types soils, Tests for determination of Specific gravity (for coarse and fine grained soils) and Water content (Oven drying method).

**3  
Hours**

2. Grain size analysis of soil sample (sieve analysis).

**3  
Hours**

3. In situ density by core cutter and sand replacement methods.

**3 Hours**

4. Consistency Limits – Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit.

**3 Hours**

5. Standard Proctor Compaction Test and Modified Proctor Compaction Test.

**3  
Hours**

6. Coefficient of permeability by constant head and variable head methods.

**3  
Hours**

7. Strength Tests

- a. Unconfined Compression Test

**3 Hours**

- b. Direct Shear Test

**Hours**

- c. Triaxial Compression Test (undrained)

**3 Hours**

8. Consolidation Test- Determination of compression index and coefficient of consolidation.

**3 Hours**

9. Laboratory vane shear test

**Hours**

**3**

10. Determination of CBR value

**Hours**

**3**

11. a) Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor's needle.

- b) Demonstration of Hydrometer Test.

- c) Demonstration of Free Swell Index and Swell Pressure Test

- d) Demonstration of determination of relative density of sands.

**3 Hours**

12. Preparing a consolidated report of index properties and strength properties of soil

**3 Hours**

#### REFERENCE BOOKS:

1. **Soil Mechanics and Foundation Engg.-** Punmia B.C. (2005), 16<sup>th</sup> Edition Laxmi Publications Co. , New Delhi.
2. **BIS Codes of Practice:** IS 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.
3. **Mittal**
4. **Soil Testing for Engineers-** Lambe T.W., Wiley Eastern Ltd., New Delhi.
5. **Manual of Soil Laboratory Testing-** Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
6. **Engineering Properties of Soil and Their Measurements-** Bowles J.E. (1988), - McGraw Hill Book Co. New York.

#### EXTENSIVE SURVEY VIVA - VOCE

Subject Code	: 10CVL68	IA Marks	: 25
No. of Practical	: 03	Exam Hours	: 03
Hours/Week			
Total No. of Practical Hours	: 42	Exam Marks	: 50

(To be conducted between 5<sup>th</sup> & 6<sup>th</sup> Semester for a period of 2 weeks, Viva voce conducted along with 6<sup>th</sup> semester exams)

An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings. **(Drawings should be done using AutoCAD)**

1. General instructions, Reconnaissance of the sites and fly leveling to establish bench marks.
2. **NEW TANK PROJECTS:** The work shall consist of
  - i) Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line.

ii) Capacity surveys.

iii) Details at Waste weir and sluice points.

iv) Canal alignment.

**(At least one of the above new tank projects should be done by using TOTAL STATION)**

3. **WATER SUPPLY AND SANITARY PROJECT:** Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.
4. **HIGHWAY PROJECT:** Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road.
5. **OLD TANK PROJECTS:** The work shall consist of
  - i) Alignment of center line of the existing bund, Longitudinal and cross sections of the centre line.
  - ii) Capacity surveys to explore the quantity.
  - iii) Details at existing Waste weir and sluice points.