SCHEME OF TEACHING AND EXAMINATION

B.E. CIVIL EINGINEERING

VI SEMESTER

Sl. No.

Subject	Code

Title of the Subject

Teaching Dept.

Teaching Hrs / Week

Examination

Theory

Practical

Duration

(Hrs)

Marks

IA

Theory / Practical
Total
1
06 CV 61
Environmental Engineering - I
Civil
04
--
03

25

100

125

2

06 CV 62

Design & Drawing of RC structures

Civil

02

03

04

25

100

125

3

06 CV 63

Transportation Engineering – II

Civil

04

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03

25

100

125

4

06 CV 64

Geotechnical Engineering. – II

Civil

04

--

03

25

100

125

5

06 CV 65

Irrigation Engineering. & Hydraulic Structures

Civil
04
--
03
25
100
125
6
06 CV 66x

Elective-I (Group A)

Civil

04

--

03

25

100

125

7

06 CVL 67

Geotechnical Engineering. Lab.

Civil

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03

03

25

50

75

8

06 CVL 68

Extensive Survey Viva Voce

Civil

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03

03

25

50

75

Total

24

09

25

200

700

900

Elective-I (Group A)

06 CV 661

Matrix Method of Structural Analysis

06 CV 665

Ground Water Hydrology

06 CV 662

Alternative Building Materials and Technologies

06 CV 666

Rural Water Supply and Sanitation

06 CV 663

Ground Improvement Techniques

06 CV 667

Traffic Engineering

06 CV 664

Advanced Surveying

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 06CV61
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: Human activities and environmental pollution. Requirement of Water for various beneficial uses. 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. Concept of safe water, wholesomeness & palatability, water born diseases. Examination of Water :- Objectives – Physical chemical and Microbiological Examinations, (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. Sampling of water for examination.

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 clari-flocculator.

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.

4 Hours

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

REFERENCE BOOKS:

1. **Water Technology – Hammer and Hammer.**
2. **Environmental Engineering- Howard S. Peavey, Donald R. Rowe, George**
3. **Tchnobanoglous, McGraw Hill International Edition.**

DESIGN & DRAWING OF RC STRUCTURES

Subject Code	
: 06CV62	
IA Marks	
: 25	
No. of Lecture Hours/Week	
: 02 (T) +03 (D)	

Exam Hours

: 04

Total No. of Lecture Hours

: 26 (T) + 39 (D)

Exam Marks

: 100

□□□□□□

PART - A

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

2. Beam and Slab floor system, continuous beams.

3. Staircase: Dog legged and Open well.

4. Column footing: Column and footing (Square and Rectangle).

13 (T) + 18 (D)

PART - B

1. Rectangular Combined footing slab and beam type.

2. Retaining walls (Cantilever and counter fort type).

3. Circular and Rectangular water tanks resting on ground (Flexible base and Rigid base), using IS: 3370 (Part IV) only.

4. Simple Portal Frames (Single bay & Single storey)

13 (T) + 21 (D)

reference BOOKS:

1. Structural Design and Drawing- Krishnamurthy -, (Concrete Structures), CBS publishers, New Delhi. Tata Mc-Graw publishers.

2. Design of RC structures- N. Krishnaraju, CBS publishers, New Delhi.

3. Reinforced Concrete Structures - B.C. Punmia – Laxmi Publishing Co.

TRANSPORTATION ENGINEERING-II

Subject Code

: 06CV63

IA 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.

1 Hour

Permanent way: Introduction, requirements for an ideal permanent way, typical cross sections of single and double line B.G. tracks – in cutting , embankment and electrified tracks. Gauges and types of gauges with dimensions. Coning of wheels and tilting of rails. Track stresses in rails, sleepers, ballast and subgrade. Problems on these. Rails functions requirements, types of rail sections, length of

rails, defects in rails. Wear on rails, rail joints, welding of rails, creep of rails.

6 Hours

Unit - 2

Ballast and Sleepers: Functions, requirements, types, track fittings and fasteners, calculation of quantity of materials needed for laying a track. Traction and tractive resistances, tractive power, Hauling capacity. Problems on above.

4 Hours

Unit - 3

Geometric Design of Track: Necessity of Geometric Design of railway track, gradient and types of gradient. Speed of train, curve, transition curve, super elevation, cant- deficiency, negative cant- speed calculation based on Indian Railways Formulae for High speed tracks only-problems on above.

7 Hours

Unit - 4

Points and Crossing: Necessity and its components, turnout, design of turnout, Types of switches, crossings, track junctions. Stations and yards, marshalling yard, signalling and interlocking, track defects, track maintenance, level crossing, Indian Railway standards (no derivations, only relevant problems). Equipment in stations and yards such as turn-table, water columns, fouling marks, buffer stops etc.

8 Hours

PART - B

AIRPORT, TUNNELS & HARBOUR ENGINERING

Unit - 5

INTRODUCTION: Introduction to airport engineering, Recent

Development by AAI. Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications - Site selection- Regional Planning.

5 Hours

Unit - 6

1) RUNWAY DESIGN- Orientation of runway by using wind rose diagram, the runway configurations- basic length of the runway –corrections to runway length by ICAO and FAA specification- runway cross sections- problems on above.

4 Hours

2) TAXIWAY DESIGN: Factors affecting the layout of the taxiway-geometrics of taxiway- design of Exit taxiways- ICAO Specifications. Problems on above.

3 Hours

3) VISUAL AIDS: Airport marking – lightings- ILS, other navigational aids.

2 Hours

Unit - 7

TUNNELS: Introduction – types of tunnels, advantages and

disadvantages, economics of tunnelling, tunnel surveying, transferring of centreline and gradient from the earth surface to inside the tunnel working face. Design of shape and size of tunnel. Soil classification and metods of tunnelling in soft soil (only Forepoling and Neddle Beam method). Liner Plate Method of tunnelling. Tunnelling in rock

- vertical shafts, pilot tunnelling, methods of tunnelling in hard rock. Mucking and methods, drilling and drilling patterns. Tunnel lining and tunnel ventilation.

6 Hours

Unit - 8

HARBOURS: Introductions, classifications, natural phenomenon affecting the design of harbour viz. wind, wave, tide and currents. Harbor layout with component parts, breakwaters, wharfs and Quays, Jetties and Piers, Dry Dock and Wet Dock, Slipways, Navigational aids. Warehouse and Transit shed.

6 Hours

TEXT BOOKS:

1. **Railway Engineering- Saxena and Arora, Dhanpat Rai and Sons, New Delhi.**
2. **Railway Engineering- Satish Chandra and Agarwal, M.M., Oxford University Press, New Delhi**
3. **Indian railway Track, Agarwal M.M, Jaico Publications, Bombay.**
4. **Airport Planning and Design – Khanna, Arora and Jain – Nemchand Roorkee.**
5. **Dock & Tunnel Engineering- Srinivasan R Harbour, Charotar Publishing House.**
6. **Docks and Harbor Engineering- Oza H.P. and Oza G.H., Charotar Publishing House.**

REFERENCE BOOK:

1. Railway Track Engineering- Antia.

GEOTECHNICAL ENGINEERING – II

Subject Code

: 06CV64

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, sounding tests, geophysical methods-Electrical resistivity and Seismic refraction methods.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.

7 Hours

UNIT - 2

DRAINAGE AND DEWATERING: Location of ground water table in fine and coarse grained soils. Determination of ground water level by Hvorselev's method. Control of ground water during exavation: Dewatering- Ditches and sumps, well point system, Shallow well system, Deep well system, Vaccum method, Electro- Osmosis method.

5 Hours

UNIT - 3

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

6 Hours

UNIT - 4

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, graded filter.

6 Hours

PART - B

UNIT - 5

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest, Earth pressure coefficient.

Earth pressure theories- Rankine's and Coulomb's –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.

8 Hours

UNIT - 6

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

□□□□□□□□□□

7 Hours

UNIT - 7□

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.Plate load test, Standard penetration test, cone penetration test.

8 Hours

UNIT - 8

FOUNDATION SETTLEMENT: Settlement Analysis, Data for settlement analysis, computation of settlement, Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 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), 16th Edition Laxmi Publications Co. , New Delhi.**

References Books:

1. **Foundation Analysis and Design- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.**
2. **Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th 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., Newe Delhi.**
4. **Geotechnical Engineering- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.**

5. Soil Mechanics- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.

6. Principles of Geotechnical Engineering- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.

7. Text Book of Geotechnical Engineering- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES

Subject Code	: 06CV65
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. Benefits and ill effects of irrigation. Sources of water for irrigation. Systems of irrigation : Surface and ground water, flow irrigation, Lift irrigation, Bhandhara irrigation. Methods of irrigation in India – Potential and development.

6 Hours

UNIT - 2

IRRIGATION AND WATER REQUIREMENTS OF CROPS: Definition of duty, Delta and Base period, Relationship between Duty, Delta and Base period, Factors affecting duty of water. Crops and crop seasons in India, Crops grown in Karnataka, their seasons, local names. Agro-climatic zones of Karnataka. Irrigation efficiency, Frequency of irrigation.

8 Hours

UNIT - 3

CANALS: Definition. Types of canals, Alignment of canals. Design of canals by Kennedy's and Lacey's methods.

4 Hours

CANAL WORKS: *Canal regulators*: Classification and suitability.

Canal drops:

Classification. Hydraulic design principles for notch type drop.

Cross drainage works: Classification. Hydraulic design principles for an aqueduct.

4 Hours

UNIT - 4

RESERVOIRS: Definitions. Investigation for reservoir sites. Storage zones. Determination of storage capacity and yield of a reservoir using mass curve.

6 Hours

Part - B

UNIT - 5

DIVERSION WORKS: Definition. Layout. Types of weirs and Barrages. Design of Impermeable floors – Bligh's and Lane's theories – Simple

design problems. Khosla's theory – Method of independent variables, Exit gradient (No design problem).

6 Hours

UNIT - 6

GRAVITY DAMS: Definition. Forces acting on a Gravity dam. Modes of failures. Elementary and practical profile. Low and high gravity dams. Simple analysis problems, Principal stresses. Drainage galleries.

8 Hours

UNIT - 7

EARTHEN DAMS: Introduction. Types of earthen dams. Failure of earthen dams. Preliminary design. Drainage arrangements. Phreatic line. Stability analysis under sudden draw down using Sweedish slip circle method.

6 Hours

UNIT - 8

SPILLWAYS: Definition. Types of Spillways. Design Principles for an Ogee Spillway. Energy dissipaters: Types and introduction to IS Stilling basins (No design problems).

4 Hours

TEXT BOOKS:

1. Irrigation, Water Resources, and Water Power Engineering- P.N. Modi, - Standard Book House, New Delhil.

2. Text Book of Irrigation Engineering and Hydraulic Structures- R.K. Sharma- Oxford and IBH Publishing Co., New Delhi.

3. Irrigation and Water Power Engineering- B.C. Punmia and Pande Lal, - Laxhmi Publications, New Delhi.

REFERENCE BOOKS:

1. Irrigation Engineering and Hydraulic Structures- S.K. Garg, - Khanna Publications, New Delhi.

2. Irrigaiotn Theory and Practices- Michael A.M- Vikas Publications, New Delhi.

3. Irrigation Engineering and Hydraulic Structures- Sahasra Budhe- Dhanpath Rai Publications, New Delhi.

MATRIX METHODS OF STRUCTURAL ANALYSIS

Subject Code

: 06CV661	

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 to flexibility method, Element flexibility matrix, Principle of contragradience, and Force Transformation Matrix, Member Flexibility matrix, Construction of structure flexibility matrix. Matrix determination of the displacement vector, Determination of member forces.

6 Hours

UNIT - 2

Analysis of axially rigid continuous beams by flexibility method using Force Transformation Matrix

6 Hours

UNIT - 3

Analysis of rigid plane frames with axially rigid members by flexibility

method using Force Transformation Matrix.

6 Hours

UNIT - 4

Analysis of trusses by flexibility method Using Force Transformation Matrix.

6 Hours

PART - B

UNIT - 5

Fundamentals of the stiffness method, equivalent joint loads, DisplacementTransformation matrix. Member stiffness matrix, Total or System stiffness matrix, Truss analysis by stiffness method using Displacement Transformation Matrix.

8 Hours

UNIT - 6

Continuous Beam and rigid frame analysis with axially rigid members by stiffness method using Displacement Transformation Matrix.

8 Hours

UNIT - 7

Introduction to direct stiffness method, Local and global co-ordinate system, Transformation Of variables, Transformation of the member displacement matrix, Transformation of the member Force matrix, Transformation of the member stiffness matrix, Transformation of the

stiffness Matrix of the member of a truss, Transformation of the stiffness matrix of the member of the Rigid frame, Overall stiffness matrix, Boundary conditions, Computation of internal forces.

4 Hours

UNIT - 8

Analysis of trusses and continuous beams by direct stiffness method.

8 Hours

TEXT BOOKS:

1. Matrix, finite elements, Computer and Structural analysis- M Mukhopadhyay - Oxford &IBW,1984

2. Matrix Analysis of framed structures- W. Weaver J.M. Gere - CBS publishers and Disributers,1986

3. Computational structural Mechanics- S Rajshekharan. G Sankara Subramanian - PHI, 2001

4. Structural Analysis A Matrix Approach- G.S Pandit & S P Gupta Tata Mc Graw-Hill, 1981

5. Basic structural Analysis- C.S Reddy - Tata Mc Graw-Hill, 1996

REFERENCE BOOKS:

1. Structural Analysis- L S Negi and R S Jangid - Tata Mc Graw-Hill, 1997

2. Introduction to Matrix Methods of Structural analysis - H C Martin -International text book Company, 1996

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code

: 06CV662

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 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 Hours

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 cience, 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**

4. 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND IMPROVEMENT TECHNIQUES

Subject Code

: 06CV663

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

Ground Improvement: Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique.

4

Hours

Mechanical Modification: Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.

2 Hours

Unit - 2

Compaction: Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behavriour 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.

8 Hours

Unit - 3

Hydraulic Modification: Definition, aim, principle, 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: Drainage of slopes., preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering.

6 Hours

PART - B

Unit - 5

Chemical Modification-I: Definition, aim, special effects, and methods. Techniques – sandwich technique, admixtures, cement stabilization.

Hydration – effect of cement stabilization on permeability, Swelling and shrinkage.

Criteria for cement stabilization. Stabilization using Fly ash.

6 Hours

Unit - 6

Chemical Modification-II: Lime stabilization – suitability, process, special effects, criteria for lime stabilization. Other chemicals, chlorides, hydroxides, lignin, 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): . Introduction, Soil reinforcement. Thermal methods.. Ground improvement by confinement – Crib walls, Gabions and Mattresses. . Anchors, Rock bolts and soil nailing.

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

: 06CV664

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 measurem

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. Mikhalil 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

: 06CV665

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: 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 Horurs

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.

RURAL WATER SUPPLY AND SANITATION

Subject Code

: 06CV666

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

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

6 Hours

UNIT - 2

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

□□□□□□□□□6 Hours

UNIT - 3

RURAL SANITATION: Conservancy, 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: Garbage, ash, rubbish, collection methods, transportation, disposal – salvaging, dumping, controlled tipping, incineration, 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

: 06CV667

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

: 06CVL67

IA Marks

: 25

No. of Practical Hours/Week

: 03

Exam Hours

: 03

Total No. of Practical Hours

: 42

Exam Marks

: 50

1. Tests for determination of specific gravity and moisture content.

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

3 Hours

c. Triaxial Compression Test (undrained)

3 Hours

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

4 Hours

9. Laboratory vane shear test

3 Hours

10. Determination of CBR value

4 Hours

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.

□□□□□□
□□□□□□□□
4 Hours

REFERENCE BOOKS:

1. Soil Testing for Engineers- Lambe T.W., -Wiley Eastern Ltd., New Delhi.
2. Manual of Soil Laboratory Testing- Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
3. Engineering Properties of Soil and Their Measurements- Bowles J.E. (1988), - McGraw Hill Book Co. New York.
4. 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.

EXTENSIVE SURVEY VIVA - VOCE

Subject Code

: 06CVL68

IA Marks

: 25

No. of Practical Hours/Week	
	: 03
Exam Hours	
	: 03
Total No. of Practical Hours	
	: 42
Exam Marks	
	: 50

(To be conducted between 5th & 6th Semester for a period of 2 weeks, Viva voce conducted along with 6th 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.

1. General instructions, Reconnaissance of the sites and fly levelling 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 .(Drawing should be preferably

done using AutoCAD)

5. TRIANGULATION SURVEY: Field work to include base line measurement, observations to three stations and one satellite station.