

Solapur University, Solapur
Structure of T.E.(Civil Engineering) Part I & II
w. e. f. Academic Year 2009-10.
T.E.(Civil Engineering) Part -I

Sr.No.	Subject	Teaching/Week					Examination scheme				
		L	Pr.	Tu.	Dr.	Total	Theory Paper	TW	POE	OE	Total
1.	Design of Steel Structures	3	2	-	-	5	100	25	-	-	125
2.	Geotechnical Engg.I	3	2	-	-	5	100	25	25	-	150
3.	Building Planning & Design	3	-	-	4	7	100	50	-	25	175
4.	Environmental Engg.I	3	2	-	-	5	100	25	25	-	150
5.	Engineering Management-I	3	-	-	-	3	100	-	-	-	100
6.	Transportation Engg.-I	3	2	-	-	5	100	25	-	-	125
Total		18	08	-	04	30	600	150	50	25	825

Note: Students shall undergo a field training of 10 days in the winter vacation after T.E. Part I and submit the field training report, which shall be assessed as a part of term-work of Engineering Management- II in T.E. Part II.

T.E.(Civil Engineering) Part -II

Sr.No.	Subject	Teaching/Week					Examination scheme				
		L	Pr.	Tu.	Dr.	Total	Theory Paper	TW	POE	OE	Total
1.	Structural Mechanics-III	4	2	-	-	6	100	25	-	-	125
2.	Geotechnical Engg.II	4	2	-	-	6	100	25	-	-	125
3.	Environmental Engg.II	3	2	-	-	5	100	25	-	-	125
4.	Engineering Management-II	4	2	-	-	6	100	50	-	50	200
5.	Transportation Engg.-II	3	-	-	-	3	100	-	-	-	100
6.	Steel Structural Design & Drawing	-	-	-	4	4	-	50	-	50	100
Total		18	08	-	04	30	500	175	-	100	775

Note: Students shall undergo a field training of 15 days in the summer vacation after T.E. Part II, which shall be assessed in B.E. Part I by the concerned project guides.

T.E. (CIVIL ENGINEERING) PART- I

DESIGN OF STEEL STRUCTURES (w.e.f. July 2009)

Teaching Scheme:

Lectures: 3 hours per week
Practical: 2 hours per week

Examination Scheme:

Theory paper: 100 marks
Term work: 25 marks

SECTION I

UNIT 1: Introduction to Design of Steel Structures (02)

Advantages and Disadvantages of steel structures, permissible stresses, factor of safety, methods of design, Types of connections, various types of standard rolled sections, Types of loads and load combination.

UNIT 2: Design of Welded and Bolted Connections (05)

Types of welds, failure of welded joints, Throat thickness, permissible stresses, analysis of axially and eccentrically loaded connections (subjected to bending and torsion), Types of bolts, nut and washer assembly, stresses in bolts and design.

UNIT 3: Tension Members (04)

Common sections, net effective area of bar, angle, tees and flats. Load carrying capacity, connection of section to gusset using weld / bolts. Design of tension splice.

UNIT 4: Compression Members-Struts (04)

Common sections used in trusses, effective length and slenderness ratio, permissible stresses, Load carrying capacity, connection of section to gusset using weld / bolt.

UNIT 5: Beams (06)

Laterally supported and unsupported beams, design of simple beam, built up beams using flange plates. Curtailment of flange plates, web buckling and web crippling. Secondary and main beam arrangement, beam to beam connections.

SECTION II

UNIT 6: Gantry Girder (03)

Forces acting on gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam, connection details.

UNIT 7: Roof Trusses (05)

Various component of an industrial shed, Types of trusses, load calculation and combination, design of purlins, design of members, Design of hinge and roller supports.

UNIT 8: Columns (05)

Simple and built up section; lacing, battening, column subjected to axial force and bending moment, column splices.

UNIT 9: Column Bases**(05)**

Slab base, Gusseted base and moment resisting bases, Design of anchor bolts, design of pedestal.

UNIT 10: Introduction to plastic Analysis & Limit State Method of Design (03)

Plastic moment, moment curvature relationship, plastic hinges, theorem of plastic analysis, mechanisms, application of virtual work method to beams.

Introduction to Limit state method of design as per IS: 800-2007 for simple tension member, compression member & beams.

Note:

Use of IS 800, IS 875, IS: Handbook No. 1 for steel section and steel table is permitted for theory examinations.

- **Term work** shall consist of at least eight assignments based on theoretical course above.

- **Books Referred –**

1. Design of Steel Structures, by S. K. Duggal, Tata Mc Graw Hill publishing company Ltd., New Delhi.
2. Design of Steel Structures, Vol- I & Vol-II by Ramchandra, Standard Book House, New Delhi
3. Design of Steel Structures, by Dayaratnam, Wheeler Publishing, New Delhi.
4. Design of Steel Structures, by B.C.Punmia, Jain & Jain Laxmi Publication, New Delhi.
5. Design of Steel Structures, by A.S. Arya and J.L. Ajamani, Nemchand and Bros., Roorkee.
6. Design of Steel Structures, by Vazirani & Ratwani.
7. Design of Steel Structures, by – E.H. Gaylord and C.N. Gaylord, Mc Graw Hill, New York.
8. Design of Steel Structures, Vol- I by J.E. Lothers, Prentice Hall New Jersey
9. Steel Structures: Design and Behaviour by C.G. Salmon and J.E. Johnson, Harper and Row, New York.
10. Design of Steel Structures, by N. Subramanian by Oxford University Press, Based on the limit state method of design as per latest Indian standard code IS: 800 (2007).

T.E. (CIVIL ENGINEERING) PART- I
GEOTECHNICAL ENGINEERING –I (w.e.f. July 2009)

Teaching scheme:-

Lectures – 3 Hrs/ week

Practical – 2 Hrs/ week

Examination scheme -

Theory Exam- 100 marks

Term work – 25 marks

Practical Oral Exam- 25 marks

Section –I

Unit 1

(08)

Introduction:- Definition of soil and soil engineering, Application areas of soil mechanics, 3- phase soil system, soil moisture.

Index properties of soil:- Different unit weights of soil and their determination, unit weight of solids, unit weight of soil mass viz. saturated unit weight, submerged unit weight, dry unit weight. Method for determination of field density viz. Sand Replacement and Core Cutter.

Specific gravity and its determination methods. Voids ratio, Porosity, Degree of saturation, Percentage air voids and their inter relationship. Density index

Soil consistency:- Atterberg's limits and their significance

Soil classification:- Soil classification based on particle size and consistency, I.S. classification system of soil, soil structure and fabric

Unit 2

(06)

Flow of water through soil:- Permeability – head , gradient and potential , Darcy's law and its validity, Factors affecting permeability, Field and laboratory methods of determining permeability, seepage pressure, Quick sand condition, Derivation of Laplace's equation, flow net and its application, Construction of flow net , Piping phenomenon

Unit 3

(07)

Shear strength :- Concept of shear, Coulomb's theory and failure envelope, Total stress approach, effective stress approach and pore water pressure, Representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesionless, saturated and partly saturated soil etc. Application of shear strength parameters in the field.

Different types of shear tests:- Unconsolidated Undrained (U-U), Consolidated Undrained (C-U) and consolidated drained test (C-D). Choice of type of test, Box shear test, Triaxial

compression test with pore pressures and volume change measurements, Unconfined compression test, Vane shear test.

Section –II

Unit 4 (05)

Compaction:- Theory of compaction, factors influencing compaction, compacted density. Laboratory Standard and Modified compaction test, Method and measurement of field compaction, field compaction control

Unit 5 (07)

Compressibility and consolidation:

Compressibility:- Definition, compressibility of laterally confined soil, compression of sand and clay., $e - p$ curve, $e - \log p$ curve, compression index

Consolidation:- Terzaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation, degree of consolidation, relevance of one dimensional consolidation to field condition, time factor

Unit 6 (07)

Earth pressure theory:- Concepts, area of application, Earth pressure at rest, active and passive conditions. Rankine's and Coulomb's theory of earth pressure, Graphical solution- Trial wedge method, Culman's method – Rehman's construction and modification. Critical depth of open cut in cohesive soil

- **Term work: (25 marks)**

It shall consist following experiments in the laboratory:

1. Specific gravity determination of coarse and fine grained soil
2. Particle size distribution- Mechanical sieve analysis, wet sieve analysis
3. Determination of Atterberg's consistency limits
4. Permeability- Determination of coefficient of permeability
5. Field density determination
6. Direct box shear test

7. Proctor compaction test
8. Triaxial test
9. Unconfined compression test
10. One dimensional consolidation test

• **Books Referred –**

1. Soil Mechanics in Engineering Practice - Terzaghi and Peck, John Willey and sons , New York
2. Fundamentals of Soil mechanics - Taylor D.W, [John Wiley, New York]
3. Soil mechanics in theory and practice- Alam Singh [Asian Publishing House, Bombay]
4. Soil Mechanics and foundation Engineering- B.S. Punmia [Laxmi publications (P) Ltd, New Delhi]
5. Geotechnical Engineering- Purushottam Raj [Tata Mcgraw hill company Ltd, New Delhi]
6. Soil Mechanics and Foundation Engineering -V.N.S. Murthy [UBS publishers and distributors, New Delhi]
7. Geotechnical Engineering- Kasamalkar B.J. [Pune Vidyarthi Griha Prakashan, Pune]
8. Geotechnical Engineering - C. Venkatachalam [New Age International (I) Ltd, New Delhi]
9. Soil Testing -T.W. Lambe [Willey Eastern Limited, New Delhi]
10. Relevant I.S. codes on soil testing

T.E. (CIVIL ENGINEERING) PART- I
BUILDING PLANNING & DESIGN (w.e.f. July-2009)

Teaching Scheme:

Lectures: 3 hours per week

Practical: 4 hours per week

Examination Scheme:

Theory paper: 100 marks

Term work: 50 marks

Oral Exam: 25 Marks

Section-I

Unit 1:- DIMENSION RELATIONSHIPS (01)

Dimensions & Space requirement in relation to body measurements, space design for passage between walls, service access, stairs ramps, elevators.

Unit 2:- PLANNING AND DESIGN OF PUBLIC BUILDINGS (15)

Planning and Design, site elevation, site layout for various types of building such as:

- a) Educational Building: Younger age range, Middle age range, older age range, School for mentally retarded.
- b) Building for health – Sanatorium, Hospitals.
- c) Assembly buildings - Recreation Hall, Community hall, Cinema theaters, Gymnasiums, Restaurant, Temples, Dance hall, Clubs.
- d) Business and Mercantile building – Shops, banks, markets, & departmental stores
- e) Industrial Buildings: Factories, Warehouses
- f) Office and Other building: Post office, Administrative building etc.
- g) Building for transportations – Bus Station, Truck Terminals
- h) Computers centres, Service Centre for communication and electronic media

Unit 3:- PERSPECTIVE (05)

Elements of perspective drawings, parallel perspective and angular perspective.

Section-II

Unit 4:- GREEN BUILDINGS AND CAD (05)

- a) Computer aided design and drawing, Development of plan, Elevation and Section.
- b) Concepts of Green Building and energy Efficient buildings.

UNIT 5:- ACCOUSTIC SOUND INSULATION (08)

- a) Acoustic- Sound Frequency, Intensity, sound decibel rating, absorption of sound- Various materials. Sabine's formula, optimum reverberation time, conditions for good acoustics, effect of reflectors, flat ceiling, design of an auditorium, defects in auditorium and remedies, acoustics of various buildings such as Auditorium hall, Classrooms, broadcasting room etc.
- b) Sound insulation: Acceptable noise level – Noise prevention at its source, transmission of noise, Noise control- general Consideration.

UNIT 6:- FIRE RESISTANT STRUCTURES**(04)**

Fire resistant Structures- Fire protection precautions, confining of fire, Fire hazards, characteristics of fire resistant material, various building material and resistance. For fire, Fire resisting construction, fire load- Normal and abnormal, distribution of fire load, grading of structural elements and buildings, fire escapes.

UNIT 7:- AESTHETICS**(02)**

A) The Nature of Architecture- Definition and Scope of the study.
B) The Aesthetic component of building, terms such as mass, space, proportion, Symmetry, balance, contract, pattern... Introduction to concept of Interior Designing and landscaping.

- **Term work (for all drawing work use full size sheets)**

- I) Planning Designing of building project for which min. 3 Sheets to be drawn as shown below.
 - A) Permission Drawing- 2 Sheets
 - B) Furniture layout and Drainage layout – 1 Sheet.
 - C) Perspective drawing of the above building.
- II) A) Drawing a perspective view of two small objects, total 2 exercises-1 sheet.
- III) One dimensional line plan for each type of building from unit no.2 (a to h) on full size graph sheets – total 4
- IV) Report on building project under (I) above.
(Oral examination shall be based on Term Work)

QUESTION PAPER SHALL HAVE SECTION OF 40 MARKS DEVOTED TO DRAWING.

- **Books Referred –**

1. A Text Book of Building Construction: Arora and Bindra
2. Building Construction by Mc'kay, Vol.III and IV
3. Modern Building Construction by Warland, Vol.I and II
4. Building Design and Drawing – Y.S.Sane
5. Building Drawing – Shaha, Kale, Patki
6. Principles of Perspective drawing- Shaha, Kale, Patki
7. Building Planning by Shaha, Kale
8. Construction science – by Walkar and Morgan
9. Environment and services-by Mitchell
10. Time savers standards for buildings – Calender Pub. Mcgraw Hill
11. Planning by E and OE – Pub. London Illiffe and Sons Ltd.
12. Nuclear Reactor- Materials by Smith
13. Materials for Nuclear Power Reactors- by Hausner
14. Art in everyday life by Goldstein, Oxford Pub.
15. Inside Outside- Magazine issues.
16. Development Control Rules- Booklet of Local Authority.
17. Building Construction by Sushilkumar
18. Alternative Building Materials & Technology-by Jagdish ,Reddy, Rao
19. Maintenance of Building- by A.C. Panchdhari
20. Interior Design- Principles and Practice- M.Pratap Rao
21. Building Planning and Design by Kumar Swami and Kameshwarrao.
22. Civil Engg. Drawing- by M.Chakrabarti.

T.E. (CIVIL ENGINEERING) PART- I
ENVIRONMENTAL ENGINEERING –I (w.e.f. July 2009)

Teaching Scheme

Lectures: 3Hrs/ Week
Practical: 2Hrs/Week

Examination Scheme

Theory papers: 100 Marks
Term Work: 25 Marks
Practical/Oral: 25 Marks

SECTION I

Unit 1:Quantity and Quality of Water (06)

Sources of water, Quality & Quantity of water sources, Intake work, Demand of water, factors affecting demand, Fluctuation in water demand and its effect, Design period, Population forecast.

Water quality parameters, characteristics and their significance, Drinking water quality standards.

Unit 2:Water Treatment processes (14)

a) Concepts of water treatment, Sequencing of treatment units for various qualities of surface and ground water, Aeration, Coagulation, Types of Coagulant, dosing, rapid mixing, Flocculation.

Solid separation theory, Types of Sedimentation tanks and design, Tube and plate settler, Design of clariflocculator,

Theory of filtration, Slow sand, Rapid sand, Dual multimedia Roughing and pressure filters- Operation and design.

Disinfection techniques- Ozonation, u/v radiation, Chemistry of chlorination, chlorine demand curve. Types of chlorination, Application of Chlorine.

b) Water softening Processes, Chemical Precipitation, Ion Exchange, Reduction of dissolved salt. Introduction to Membrane , Carbon filtration, Adsorption process.

Salient features of rural water supply scheme. The package water treatment plant.

SECTION II

Unit 3:Conveyance of Water (06)

Transmission of water, pumping and gravity mains, choice of pipe materials, forces acting on pressure pipes, Design and pressure testing of cast iron and mild steel mains, economic size of conveying main, thrust block design.

Corrosion types and control measures.

Unit 4:Distribution of Water (09)

Water distribution systems, method of distributing water, system configuration, appurtenances, basic system requirements, hydraulic analysis head balance method, quantity balance method, equivalent pipe concept, Newton – Raphson and linear theory methods

Unit 5:Maintenance of Distribution System (05)

Maintenance of water distribution systems, leak detection, concept of water quality, variations in distribution systems.

Distribution reservoir, service storage, necessity, location, calculations of head and capacity requirements.

Scope of computer applications in Environmental Engg.

- **Term work**

A) Experiments for the determination of the following (Min. 10)

- 1 p^H value
- 2 Alkalinity
- 3 Acidity
- 4 Chloride content
- 5 Hardness
- 6 Turbidity
- 7 Residual Chlorine
- 8 Total Dissolved Solids through measurement of conductivity
- 9 Solids – Total, Suspended, dissolved, volatile and fixed
- 10 Dissolved Oxygen
- 11 Most Probable Number
- 12 Optimum dose of alum by jar test
- 13 Fluorides
- 14 Nitrogen
- 15 Irons and Manganese

B) Design /Analysis Problems on each water treatment unit and distribution system.

C) Visit to water treatment plant

Term work submission shall consist of journals containing

1. Above mentioned Experiments
2. Visit report describing the water treatment units of the plants visited.
3. Design problems mentioned in B

Practical and oral:-

Practical examination shall consist of any one experiment among those carried out as apart of term work.

Oral shall based on the above syllabus.

- **Books Referred –**

1. Environmental Engineering by Peavey, H.S. rowe, D.R. and Tchobanoglous McGraw –Hill Book Company.
2. Water supply and pollution control by Viessman W. and Hammer M.J. Harper Collins College Publishers.
3. water and waste water Technology by Hammer M.J. Prentice-Hall of India Pricvate ltd.
4. Manual on Water Supply and Treatment- Government of India Publication.
5. Water Supply, S.Chand and Company by Duggal K.N.
6. Water Supply by Garg S.K., Khanna Publishers
7. Water Supply and Waste water Disposal by Fair and Gayes, Jhon Wiley Publication.
8. Water Supply Engineering by B.C.Punmia, Ashok Jain, Arun Jain, Laxmi Publications

**T.E. (CIVIL ENGINEERING) PART- I
ENGINEERING MANAGEMENT – I (w.e.f. July 2009)**

Teaching Scheme:
Lectures: 3 Hours /Week

Examination Scheme:
Theory Paper : 100 Marks

SECTION – I

- Unit 1** (05)
Evolution of Management thought
Scientific Approach: Principles, Time study, Motion study
Human behavior Approach: Informal Organization, Hierarchy of needs, Theory X, Theory Y.
Classical (General) Management: Principles
System approach
Contingency Approach
- Unit 2** (05)
Functions of Management
Planning – Process of planning, Types of planning - policies and strategies, Management by objectives.
Formal and Informal organization, Centralization, Decentralization, Line, Line and Staff, Functional organization.
Leading, directing, controlling and coordination
Communication process, motivation
- Unit 3** (06)
Material Management – Purchasing principles, stores : coding system, function, Responsibilities, record and accounting.
Inventory control – An introduction, inventory cost, **EOQ** analysis, **ABC** analysis, safety stocks.
- Unit 4** (04)
Marketing management: Marketing Environment, consumer markets and buyer behavior, marketing mix, Advertising and sales promotion, channels of distribution

SECTION – II

- Unit 5** (06)
Importance of Decision Making, steps in decision making
Decision under certainty: Linear Programming, Formulation of simple L-P model, Graphical method, Simplex method – Duality, Application of Linear Programming in Transportation Problems: North-West corner method, Least cost method, Vogel's Approximation method and Application in Assignment problems
- Unit 6** (04)
Decision under uncertainty: Wald's, Savage, Hurvicz and Laplace criterion of optimism and regret, expected monetary value, Theory of games (dominance pure and mixed strategy).
Decision under risk: Decision tree.
- Unit 7** (06)
Queuing or waiting line theory: Applications, Characteristics, Waiting Time and Idle Time costs, Single channel Queuing Problems for calculating average no of customers and Average time in system and Queue. **Monte Carlo Simulation:** Concept, Procedure and Advantages.

Unit 8

(04)

Introduction to Dynamic programming: need and characteristics, Stage and State, Process of Dynamic Programming.

Introduction to emerging optimization technique: Artificial Neural Network, Fuzzy Logic, Genetic Algorithm. (Only concept of each technique)

- **Books Referred –**

1. A Text book of Principles of Management and Personnel Management, A.S.Deshpande, Vora Publications, New Delhi, 1987
2. Principles of Management, Tripathi P. C., Tata McGraw Hill International ,
3. Management, Stoner J.A. F R. E. Freeman, Prentice Hall of India, New Delhi, 4th Ed
4. Essentials of Management, Koontz Z. H., Tata McGraw Hill Publications , 2000
5. Operation Research, Hamdy A. Taha, Prentice Hall of India, New Delhi, 6th Ed.2000
6. Principles of Operation Research, Wagner H. M. , Prentice Hall of India, 2nd Ed.
7. Optimization :Theory and Applications, Rao S.S. ,Wiley Eastern Ltd.
8. Shaum's Operation Research , Richard Bronson Govindsami N., Tata McGraw Hill , 2nd Ed.2004
9. Marketing Management in Indian Environment., Ramaswami V. S , McMillan India Co., 1998
10. Introduction to Marketing Management Text and Cases, Rewoldt S. H., R.D.Irwin Co.
11. Industrial Marketing Management, Hutt Michael D., The Dryden Press, Chicago,
12. Store Management, Menon K. S., McMillan Co. New Delhi,

T.E. (CIVIL ENGINEERING) PART- I
TRANSPORTATION ENGINEERING I (w.e.f.July 09)

Teaching Scheme:

Lectures: 3 hours per week
Practical: 2 hours per week

Examination Scheme:

Theory paper: 100 marks
Term work: 25 marks

HIGHWAY ENGINEERING

Introduction: (02)

Modes of transportations, their importance & limitations, the importance of highway transportation.

Highway planning: (05)

Principles of highway planning, Road development and financing, Privatization of Highways, highway alignment-Requirements, Engineering surveys for highway location.

Geometric Design: (05)

Cross section elements, width, camber, design speed, Sight distances, requirements and design of horizontal and vertical alignments, Grade Separator.

Highway Materials: (03)

Properties of sub grade and pavement component materials, Material characterization, Soil Subgrade, Aggregates and bituminous materials, Bituminous mix design.

Pavement Design and Construction: (03)

Design of flexible and rigid pavement, Group index and C.B.R. methods, Westergaards Analysis of wheel load, Stresses in rigid pavement, Pavement construction technique and quality control, WBM and bituminous concrete roads and highway maintenance,

Highway Drainage: (02)

Surface drainage and sub soil drainage, Pavement failures, Maintenance and Strengthening

Traffic Engineering: (04)

Fundamentals of traffic flow, Traffic field studies and their uses, Vehicular and road user characteristics, Traffic control devices, Junctions and signals, Traffic management, Urban intelligent traffic system, Prevention of road accidents.

BRIDGE ENGINEERING

Unit 1 (03)

Classification of bridges, Selection of site, Bridge hydrology: determination of design discharge, linear water way, economical span, location of piers abutments, afflux, Score depth, design problems on above topics.

Standard specification for bridges: - Indian Road Congress Bridge Code. Width of carriage way and clearance, IRS loads, Railway bridge loading, forces acting on super structure. Design considerations, aesthetics of bridge design.

Unit 2 (03)

Bridge foundations, types of bridge foundations, foundations in special condition, foundation failures, Bridge piers, Abutments, wing walls, Approaches, Piers of viaducts.

Unit 3**(02)**

Construction of various types of bridges, launching, erection and performance of bridges.
Types and suitability of foundation and bearings, maintenance rehabilitation of bridges.

TUNNEL ENGINEERING:**Unit 4****(04)**

Introduction, Consideration in tunneling, shape & size of tunnel shaft, pilot tunnel, tunneling in hard rock, methods of attack, drilling pattern, blasting, mucking, tunnel lining, (rock bolting and guniting), advances in tunneling methods. (TBM)

Unit 5**(04)**

Tunneling in soft material: Mining, timbering, mucking forepoling and shield methods.
Safety Measures, ventilation, lighting and drainage of tunnels, modern tunneling methods.

Term Work:**List of Experiment (Any 8 of Following)**

1. CBR test on soil
2. Impact test on aggregate
3. Crushing strength test on aggregate
4. Abrasion Test on aggregate
5. Hardness test on aggregate
6. Soundness test on aggregate
7. Shape test on aggregate
8. Specific gravity test on bitumen
9. Penetration test on bitumen
10. Flash and Fire point test on bitumen
11. Ductility test on bitumen
12. Softening Point test on bitumen
13. Viscosity test on Tar
14. Marshall Stability Test on bitumen mix

Assignments**• Books Referred**

1. Highway Engineering By S.K.Khanna and C.E.G.Justo- [Nemchand Bross. Roorkee]
2. Traffic and transport planning, By L.R.Kadiyali - [Khanna publisher, New Delhi]
3. Land Acquisition Act -1894
4. Bridge Engineering-S. P. Bindra
5. Bridge Engineering- Ponnuswami S.
6. Bridge Engineering- Raina
7. Bridge Engineering- John Victor
8. Specifications of Road and Bridge Works (MRT & H) Publication –Indian Road Congress, New Delhi

**T.E. (CIVIL ENGINEERING) PART II
STRUCTURAL MECHANICS III (w.e.f. July 2009)**

Teaching Schemes:

Lectures : 4 Hours per week
Practical : 2 Hours per week

Examination Schemes:

Theory Paper: 100 Marks
Term Work : 25 Marks

SECTION I

FORCE METHODS

UNIT 1: INTRODUCTION

(04)

Concept of Indeterminate structures, Degree of Static and Kinematic indeterminacy, Degrees of freedom for various types of structures, Methods of analysis and comparison of force and displacement methods.

UNIT 2: METHOD OF CONSISTENT DEFORMATIONS

(08)

Propped cantilevers, Fixed beams, Continuous beams (Degree of Static Indeterminacy $DSI \leq 2$), Yielding of supports.

UNIT 3: ENERGY METHODS

(10)

Strain Energy due to various forces, Castigliano's theorem and Unit Load method, Deflection of statically determinate beams and Structural bents, Betti's Law, Maxwell's reciprocal theorem, Two hinged arches, Indeterminate beams & Frames ($DSI \leq 2$)

UNIT 4: FLEXIBILITY METHOD

(06)

Derivation of flexibility equation, flexibility coefficients, Development of flexibility matrix, Analysis of beams and portals ($DSI \leq 3$).

**SECTION II
DISPLACEMENT METHODS**

UNIT 5: MOMENT DISTRIBUTION METHOD

(08)

Concept of stiffness of a member, Relative stiffness, Distribution factors, concept of moment distribution, Application to beams, portal frames with and without sway, Symmetry and antisymmetry, Sinking of supports, Shortcut moment distribution method.

UNIT 6: SLOPE DEFLECTION METHOD**(05)**

Slope deflection equation, Sinking of supports, Application to beams, portal frames with and without sway.

UNIT 7: STIFFNESS METHOD**(09)**

Concept of stiffness, linearly elastic structures, derivation of Stiffness equation, Stiffness coefficients, Development of stiffness matrix, Analysis of beams, portals, trusses (Degree of K.I. ≤ 3), Sinking of supports.

TERM WORK: It shall consist of assignments based on above topics.

- **Books Referred**

1. Mechanics of Structures (Vol. II) -S.B. Junnarkar, Charator Book Publishing House.
2. Structural Analysis- Negi and Jangid, Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. Matrix Analysis of Structures- Gere and Weaver, CBS Publishers, New Delhi.
4. Analysis of Structures (Vol. II) - Vazirani and Ratwani, Khanna Pub., Delhi
5. Indeterminate Structural Analysis-C.K.Wang, Tata McGraw-Hill Publishing Company Ltd., New Delhi
6. Theory of Structures- Timoshenko & Young, Tata McGraw-Hill Publishing Company Ltd., New Delhi
7. Structural Analysis- Matrix Approach- Pandit & Gupta, Tata McGraw-Hill Publishing Company Ltd., New Delhi
8. Structural Analysis-Sixth Ed.,-R.C.Hibbeler-Dorling Kindersley (India) Pvt.Ltd., Pearson Education, New Delhi.

T.E.CIVIL ENGINEERING PART II
GEOTECHNICAL ENGINEERING –II (w.e.f. July 2009)

Teaching scheme:-

Lectures – 4 Hrs/ week

Practical – 2 Hrs/ week

Examination scheme -

Theory Exam- 100 marks

Term work – 25 marks

Section –I

Unit 1:

(4)

Introduction:- General requirements for satisfactory performance of foundations.

Soil Exploration:- Necessity, Planning, Exploration methods, Different types of boring- Hand and continuous flight augers, Wash boring, Rotary drilling. Soil sampling- Disturbed and Undisturbed. Rock drilling and sampling. Core barrels, Core boxes, Core recovery, RQD

Unit 2 :

(12)

Bearing Capacity Analysis:- Bearing capacity – Ultimate, safe and allowable. Modes of failure, Terzaghi's bearing capacity equation with derivation, I S code method of bearing capacity (IS 6403 -1981), Effect of water table, Eccentricity of load, Concept of dynamic bearing capacity.

Field Test For Bearing Capacity Evaluation:- Plate load test , Standard Penetration test and Pressuremeter test. Test procedures and limitations.

Foundation Settlement:- Immediate settlement – computations as per IS 8009 – 1976 (part –I) approach and from plate load test observations. Consolidation settlement, Total settlement, Differential settlement, Tolerable settlement, Angular distortion

Unit 3:-

(07)

Foundation Construction in Difficult Soil :- Guide lines and care to be exercised in weak and compressible soil, Expansive soil, Collapsible soil , Corrosive soils

Ground Improvement Techniques:- Pre compression, Sand drains, Vibrofloatation, Grouting, Soil reinforcement

Geotextiles and it's applications:- Geotextiles- Definition and Types, Functions of Geotextiles, Different applications in Civil Engineering (Roads, Railways, Embankments, Earth Retainment, Erosion control etc)

Section –II

Unit 4:- (4)

Shallow foundations :- Design of Isolated, Combined, Strap footing (Rigid analysis), Raft foundations (Conventional method), Floating foundations (RCC design is not expected)

Unit 5:- (09)

Deep foundations:-

a) Pile foundation : Classification , Single pile capacity for RCC cast in situ pile in Cohesive, Non cohesive and mixed soils (Static method), Negative skin friction.

Under reamed piles- equipment, construction and precautions

Group action of piles- Spacing of piles in a group, group efficiency

b) Caisson Foundations: Box, Pneumatic, open (well) caissons, Shapes of well, components. Forces on caisson, grip length, well sinking, practical difficulties and remedial measures.

Unit 6 :- (06)

Cofferdams:- Various Types

Cellular Cofferdam : Types, Cell fill material, Stability consideration

Sheet Piles: Classifications, Design of cantilever sheet pile in cohesionless and cohesive soils. Design of anchored sheet pile by free earth support method

Unit 7 :-

(04)

Slope Stability:- Stability of finite slopes- slip circle method, Semi graphical and graphical methods- Swedish slip circle method, Method of slices, Friction circle method. Fellenius construction to locate critical slip center, Stability No and its use.

- **Term work: (25 marks)**

The term work shall consist Laboratory work, Field work and Assignments on above topics

A) Field tests:-

1. Standard penetration test
2. Plate Load test
3. Vane shear test

B) Visit to foundation construction sites and preparation of report.

C) Laboratory work:-

1. Swelling pressure test

D) Assignments consisting design problems on:-

1. Bearing capacity calculation by various methods
2. Settlement calculations
3. Design of shallow foundation - Isolated, Combined, Raft using conventional method.
4. Pile and Pile group - Load carrying capacity of piles, Design of pile group
5. Sheet piles - Cantilever, Anchored using Free earth support method
6. Stability analysis – Slip circle, slice method, Fellenius construction, Taylor's Stability No.

• **Books Referred :**

1. Foundation analysis and design- Bowles J. E. [Tata Mcgraw hill company Ltd, New Delhi]
2. Foundation design and construction- Tomilson [M.J. English Language Book Society, Essex]
3. Foundation Design- Teng W.C
4. Soil Mechanics and foundation Engineering -B.S. Punmia [Laxmi publications Pvt. Ltd, New Delhi]
5. Geotechnical Engineering- Purushottam Raj [Tata Mcgraw hill company Ltd, New Delhi]
6. Soil mechanics in theory and practice- Alam singh, [Asian Publishing House, Bombay]
7. Soil mechanics and foundation engineering- V.N.S. Murthy [UBS publishers and distributors, New Delhi]
8. Foundation Design Manual- Dr. N.V. Nayak [Dhanpat Rai and Sons]
9. Foundation Engineering- Kasamalkar B.J. [Pune Vidyarthi Griha, Pune]
10. Relevant I.S. codes on field tests and other topics
11. Design of sub structure- Swami Saran [Oxford and IBH Publications]

T.E. (CIVIL ENGINEERING) PART II
ENVIRONMENTAL ENGINEERING –II (w.e.f. July 2009)

Teaching Scheme

Lectures: 3Hrs/ Week

Practical: 2Hrs/Week

Examination Scheme

Theory papers: 100 Marks

Term Work: 25 Marks

Section-I

Unit -1: Collection and conveyance of Sewage (06)

Components of wastewater flows, waste water water sources and flow rate. Variation in flow rates, waste water constituents, Characteristics of municipal waste water, Quantity of storm water, Ground water infiltration.

Sewerage system, layout, types of sewers, collection system. Appurtenances Design of sanitary and storm water sewers, Maintenance of sewerage systems.

Sewage and sludge pumping, location, capacity and types of pumps, pumping station design.

Unit-2: Unit Operations (08)

Primary treatment - screening, comminuting, grit removal, oil and grease trap, chemical precipitation.

Secondary treatment – Activated sludge process, Process design and operating parameters , modification of ASP , operational problems .Trickling filter , classification , process design considerations . Secondary Clarifications.

Unit -3: Anaerobic treatment and Low cost treatment (06)

Fundamentals of anaerobic treatment, sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors.

Low cost waste water treatment methods- Principle of waste stabilization pond.

Design and operation of oxidation pond, aerobic and anaerobic lagoons, Aerated lagoon, Oxidation ditch, septic tank.

Selection of alternative treatment process flow sheets. Concept of recycling of wastewater (gray water and brown water.)

Section-II

Unit-4: Disposal of waste water (08)

Disposal of waste water stream pollution, Self purification, DO sag curve, Streeter Phelp's Equation, Stream classification, disposal on land, effluent standards for stream and land disposals. Introduction to environmental impact assessment, Assessment and Environmental legislation.

Unit -5: Solid Waste Disposal (05)

Solid waste management – Solid waste definition, Types, sources, characteristics.

Functional outlines- storage, collection, processing techniques,

Methods of treatments of solid waste-Composting, Incineration, Pyrolysis and sanitary land filling. Concept of hazardous waste management.

Unit -6: Air Pollution (07)

Air Pollution- Definition, Sources and classification of pollutants, Effects. Introduction to meteorological aspects of control of industrial air pollution- Settling Chamber, Bag filter,

Cyclone separator, Scrubbers, Electrostatic precipitators. Control of vehicular air pollution. Air quality standards.

- **Term Work:-**

Term work shall consist of the following:-

(A) List of Experiments (Analysis of Waste Water)

1. pH Value.
2. Total Solids
3. Biochemical Oxygen Demand
4. Chemical Oxygen Demand
5. Chlorides
6. Oil & Grease
7. Sulphate Content
8. Total Nitrogen
9. Demonstration of High Volume Sampler
10. Demonstration of Auto Exhaust Analyzer.

(B) Design of sewerage system & Treatment system for a small urban area.

(C) Visit to sewage treatment plant

Term work submission shall consist of the following –

1. Journal containing experiments carried out in part A of the term work and visit Report on C
2. Detail design and appropriate drawings required for part B of the term work.

- **Books Referred :**

1. Environmental Engineering by Peavey- H.S. rowe, D.R. and Thobanoglous, [McGraw –Hill Book Company]
2. Water supply and pollution control - Viessman W. and Hammer M.J. [Harper Collins College Publishers.]
3. Water and waste water Technology - Hammer M.J, [Prentice-Hall of India Private ltd.]
4. Manual of Sewerage and sewage treatment- [Government of India Publication.]
5. Masters. G.M. Introduction to Environmental Engineering and Science
6. Air Pollution- Rao M.N. and Rao H.V.N. [Tata Mcgraw Hill, 1990]
7. Solid Waste Management in Developing countries - Bhide A.D. and Sundersen B.B. [Indian National Scientific Documentation Centre, New Delhi]
8. Waste Water Engineering Treatment & Disposal - Mertsalf & Eddy, [Tata McGraw Hill, 1982]
9. Sewage Disposal and Air Pollution Engineering - Garg S.K., [Khanna Publishers]
10. Environmental Impact Assessment - Canter, [TMH Publication]
11. Manual on Municipal Solid Waste Management- Ministry of Urban Development Govt. of India.

**T.E. (CIVIL ENGINEERING) PART-II
ENGINEERING MANAGEMENT – II (w.e.f. July 2009)**

Teaching Scheme:

Lectures 4 hours per week
Practicals 2 hours per week

Examination Scheme:

Theory Paper : 100 Marks
Term Work : 50 Marks
Oral Exam. 50 marks

Unit 1: (06)

Project Management : Introduction, steps in Project Management – work break down structure.

Bar Chart, Mile stone chart.

Development of network–Representation by AOA and AON–Fulkerson’s Rule

Critical Path Method (CPM) : Introduction, Time estimates, floats, critical path.

Unit 2 (06)

Network compression – Least Cost and optimum duration.

Resource allocation – smoothening and levelling.

Updating – needs, steps, project duration, calculation for updated network.

Unit 3 (04)

Performance Evaluation and Review Techniques (PERT)

Concept of probability, normal and Beta Distribution, Central limit theorem. Time estimates and calculations of project duration, critical path, slack, probability of project completion.

Unit 4 (04)

Precedence Network – simple problems

Work Study – Methods study and time measurement, definition, Steps and introduction to recording techniques.

SECTION – II

Unit 5

Engineering economics, importance, demand and supply, types of costs, Interest – simple, compound, continuous, and effective interest.

Value of money-time and equivalence, tangible and intangible factors, Introduction to inflation. Cash- flow diagram.

Interest factors – Uniform series factors – derivations.

Unit 6 (06)

Economic comparisons –

Discontinuing methods: Present Worth method, equivalent annual cost method, capitalized cost method, Net Present Value, Internal Rate of Return, Benefit Cost ratio.

Non discontinuing criteria: Payback and urgency criteria.
Build, Operate and Transfer method

Unit 7 **(04)**

Linear Break even analysis – Problems

Quality Control – Concept, Statistical Methods, Control charts (X, R, p, c charts)

Unit 8 **(04)**

Total Quality Management – Philosophy of Juran, Deming, importance.

Quality Circle – Implementation steps.

Management Information system: Role of information in decision making, Information system planning, Design and implementation, Evaluation and effectiveness of MIS.

• **Term Work:**

1. At least two exercises on each unit.
2. Civil Engg. Problems on Bar chart, CPM, PERT, Precedence, engineering economics to be solved preferably using relevant software.
3. Visit report covering project management and quality control technique.

• **Books Referred :**

1. A Management Guide to PERT/CPM- Weist J. D. /Levy, [Prentice Hall of India, New Delhi, 2nd Ed. 1982]
2. PERT and CPM Principles and Applications- Srinath L. S., [A East West Publication, New Delhi],
3. PERT and CPM- B. C. Punmia, K.K.Khandelwal, [Laxmi Publications, New Delhi,]
4. CPM in Construction Practice, Antill J. M., [John Wiley and Sons],
5. Practical Project Management- R. G. Ghattas Sandra L., [Pearson Education],
6. Management of Industrial Construction Project- Oneill J.J., [Heinemann Publications, London]
7. Advanced Project Management A Structured Approach, Harrison F.L., [Metropolitan Publication]
8. Computerized Project Management Technique for Manufacturing and Construction , Samaras T.T. [Prentice Hall of India, New Delhi]
9. Fundamentals of TQM –Dahlgaard J.J. , [Eswar Press],
10. Principles of Construction Management- Roy Pilcher [Tata McGraw Hill Publications] ,
11. Construction Project Management – Planning, Scheduling and Control- Chitkara K.K., [Tata McGraw Hill Publications New Delhi] ,
12. Construction Planning and Management through System Technique-Verma M., [Metropolitan Publication],
13. Construction Project Management- Bennett J. M. Clough R. H., [Butterworth's

- Wiley John New Delhi],
14. Construction Scheduling with Primavera Enterprise- Marchman D.A., [Thomson/Brooks- Cole]
 15. Management of Engineering Projects- Stone Rechar, [McMillan India Co. New Delhi]
 16. Management Information System- Gupta R.C. [CBS, New Delhi]
 17. Management Information System- Davis J. B.,[Tata McGraw Hill New Delhi]
 18. Work Study / Industrial Engineering and Management-O.P.Khanna, [Dhanpatrai and Sons New Delhi]
 19. Industrial Engineering and Management Science- T.P.Banga N.K.Agarwal, S.C. Sharma, [Khanna Publishers]
 20. Handbook of Quality Control- Juran
 21. CPM in Construction Management- O'Brian, ,
 22. Statistical Quality Control- E.L.Grant [Wiley International Education, 6th Ed.]
 23. Principles of Engineering Economy- E.L.Grant,W.G.Ireson, R. S. Leavenworth, [Wiley International Education, 7th Ed.]
 24. Engineering Economics - L. P. DeGarmo W.G.Sullivan J.A.Bantadelli, [McMillan India Co. New Delhi, 8th Ed.]
 25. Manual of Construction Project Management- S. K. Guha, Thakurti, K. R. Shah, [MultiTech Publishers.]

T.E. (CIVIL ENGINEERING) PART- II
TRANSPORTATION ENGINEERING II (w.e.f.July 09)

Teaching Scheme:
Lectures: 3 hours per week

Examination Scheme:
Theory paper: 100 marks

RAILWAY ENGINEERING (03)

History of Indian Railways- Component parts of railway track, Wheel and axle arrangements, Coning of wheels, Various resistance and their evaluation, Hauling capacity, Tractive effort, Stresses in railway tracks, Stresses in rail, Stresses in sleepers, Stresses in ballast, Formation.

Permanent way component Parts (04)

Types of rail section, Creep- wear and failure in rails, Rail Joint, Welding of rails, Sleepers requirements and types, Tracks fixtures and fastening, Bearing plates, Anti-creep device, Check and guard rails. Ballast requirements, Specifications, Formations, Cross sections, Drainage.

Geometric Design (03)

Alignment, Horizontal curves, Super elevation, Equilibrium cant and cant deficiency, Length of transition curves, Gradients and grade compensation, Vertical curves.

Points and Crossing: (03)

Design of simple turn out, various types of track junction and their configurations.

Signaling and Interlocking: (02)

Control of Train movement and monitoring, Types of signals, Principle of interlocking, Modernization of railway and railway tracks, High speed tracks.

AIR PORT ENGINEERING

Air transport development: (02)

Airport scenario in India-Stages of development, Aircraft characteristics, Airport planning, Site selection, Obstruction and zoning laws, Imaginary surfaces. Approach zone and turning zones.

Runway and Taxiway design: (04)

Element of runway, Orientation and configuration, Basic runway length and correction, Geometric design elements, Taxiway design, Exit taxiway, Separation clearance, Holding Aprons, Typical Airport layout, Terminal building, Gate position

Visual Aids and Air traffic Control: (02)

Airport marking and lighting, Air way and airport traffic control, Instrumental landing systems and other navigation aids.

Heliports:**(02)**

Characteristics of helicopters, Planning of heliports, Site selection, Size orientation, Terminal area, Obstruction, Heliport markings and lighting.

DOCK AND HARBOURS ENGINEERING**(10)**

Sea and tide, Hydrographic Survey, Wind Waves & cyclone, Siltation and erosion, Ship feature, Traffic forecasting, Harbour layout, channel basin and berth, Breakwater, Jetties Dolphins & mooring, Berth for crude oil, Locks, Dry dock and slipwell, Carbohydrate equipment, Apparent, Transit shade, Wear Houses, Navigation Aids, Coastal Regulation Zone, Port Charges.

HYDROCARBON TRANSPORT ENGINEERING**(04)**

- 1 Basic data, materials and standards, Engineering Design and Consideration for Pumping of hydrocarbon (gas / oil)
- 2 Soil investigations, Construction technique, Maintenance & Safety
- 3 Corrosion and its prevention.

• Books Referred :

1. Railway Engineering- by Aggarwal M.M.
2. A Text book of Railway Engineering- by Saxcena and Arora
3. Railway and track Engineering- by Mundrey J.S
4. Track manual of Indian Railways
5. Indian Railway permanent way manual – 1986
6. Railway Engineering – K.F. Anita
7. A Course I Railway Engineering – Saxena and Arora [Dhanpat Rai & Sons Delhi]
8. Planning and Construction of Docks and Harbors –Quinn
9. Docks and Harbor Engineering _ Oza, Chartor Pub. House
10. Dock and Haror and Tunnel Engineering – Shrinivasan Chartor [Pub. House]
11. Dock and Harbor Engineering – Cormick H.F.
12. Specifications of Road and Bridge Works (MRT & H) Publication –Indian Road Congress, New Delhi

T.E. (CIVIL ENGINEERING) PART II

STEEL STRUCTURAL DESIGN AND DRAWING (w.e.f. July 2009)

Teaching Scheme:

Drawing: 4 hours per week

Examination Scheme:

Term work: 50 marks

Oral Exam: 50 marks

The term work shall consist of detailed structural design and drawing of the following steel structure along with necessary drawings.

1. INDUSTRIAL SHED:

Roof truss, Gantry girder, Roof and gantry columns, Bracing system, Column Bases by elastic method.

OR

1. INDUSTRIAL SHED:

With portal or gable frames of solid or open web sections, Gantry girder, bracing System, column bases by elastic method.

2. ANY ONE of the following:

- a) **BUILDING FRAMES:** Secondary and main beams, column and column bases, beam-to-beam connection, column-beam-connection, design of typical members by elastic method.
- b) **FOOT BRIDGE:** Influence lines, cross beam, main truss, Raker, joint Details, support details.
- c) **PLATE GIRDER:**
Design of welded plate girder.

Note:--

- 1. Design shall be based on elastic method.
A comparative design of few tension members, compression members, beams and columns shall also be done by limit state method. (As per Revised IS: 800 -2007)
- 2. Sample verification of analysis results shall be made by using software for any one problem.

• **Books Referred :**

1. Design of Steel Structures, - S. K. Duggal, [Tata Mc Graw Hill publishing company Ltd., New Delhi]
2. Design of Steel Structures, Vol- I & Vol-II - Ramchandra, [Standard Book House, New Delhi]
3. Design of Steel Structures, - Dayaratnam, [Wheeler Publishing, New Delhi]
4. Design of Steel Structures, - B.C.Punmia, Jain & Jain [Laxmi Publication, New Delhi]
5. Design of Steel Structures, - A.S. Arya and J.L. Ajamani [Nemchand and Bros., Roorkee]
6. Design of Steel Structures - Vazirani & Ratwani.
7. Design of Steel Structures, – E.H. Gaylord and C.N. Gaylord, [Mc Graw Hill, New York]
8. Design of Steel Structures, Vol- I - J.E. Lothers [Prentice Hall New Jersey]
9. Steel Structures: Design and Behaviour - C.G. Salmon and J.E. Johnson [Harper and Row, New York]
10. Design of Steel Structures, -N. Subramanian [Oxford University Press]
Based on the limit state method of design as per latest Indian standard code IS: 800 (2007).