PART-I

Subject Code	Subject	Teaching Scheme			Examination Scheme			
		Theory	Practical	Total	Theory	Term Work	Practical	Total
4001	EE-II	4	2	6	100	25	25	150
4002	WRE-II	4	2	6	100	25	25	150
4003	DS-III	4		4	100			100
4004	FE	4		4	100			100
4005	Elective-I	4	2	6	100	50		150
4006	Project –I		2	2		50		50
4007	Seminar						50	50
	Implant Training							
		20	8	28	500	150	100	750

Elective-I

1. **Town Planning**
2. **Computer Application in Civil Engineering**
3. **Prestressed concrete**

PART-II

Subject Code	Subject	Teaching Scheme			Examination Scheme			
		Theory	Practical	Total	Theory	Term Work	Practical	Total
4008	Structural Mechanics	4		4	100			100
4009	TE-II	4	2	6	100	25	25	150
4010	Construction Management	4	2	6	100	25	25	150
4011	Elective-II	4	2	6	100	50		150
4012	Project –II		4	4		50	100	150
4013	Seminar –II		2	2		50		50
		16	12	28	400	200	150	750

Elective- II

1. **Advanced Structure**
2. **Industrial Waste Treatment**
3. **Geographical Information System**
4. **Earthquake Engineering**
5. **Pavement Engineering**

ENVIRONMENTAL ENGINEERING-II (4001)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/Week	Theory: 100 Marks
Practical: 2 Hrs/Week	T/W: 25 Marks
	PR/Oral: 25 Marks
	Duration: Three Hours

Systems of sewerage- Quantity of storm sewage-quantity of sanitary sewage (Domestic waste water) - Sewer and Sewer Appurtenances- sewage pumping- maintenance of sewers.

Characteristics of Waste water: Physical, chemical and biological characteristics, waste water sampling and analysis, interpretation and practical significance of test results, Kinetics of biological growth. Effluent standards for disposal of waste water onto land, river, and irrigation.

Stream sanitation: Self purification of natural streams, Stream standards, oxygen sag curve.

Waste water treatment: Necessity of treatment, process design, theory and design of Primary treatment units.

Screens: Types of screens, design of screen chambers, grit chamber, sources of grit, velocity control in grit chamber, design of grit chamber, disposal of grit, sources of oil and grease, importance of removal, methods of oil and grease removal.

Primary Sedimentation: Necessity, Design of Primary sedimentation tank with inlet and outlet details, sludge and its disposal.

Theory and design of aerobic treatment units: Activated sludge process: Detail design of ASP.

Trickling filters: Principal involved, filter media and its characteristics, Design of Trickling filters, Single stage and double stage filters, operational problems, Rotating Biological contactors.

Low cost treatment methods: Oxidation pond, design of oxidation ponds, advantages and disadvantages.

Aerated Lagoons: Principle, aeration methods, advantages and disadvantages.

Theory and design of anaerobic treatment units: Septic tank-Principle, Design and disposal of septic tank effluent.

Anaerobic digestion, sludge digestion, design of anaerobic digesters, sludge disposal, advantages and disadvantages.

UASBR-Principle, advantages and disadvantages.

Special treatment methods-Adsorption, Reverse Osmosis, Deflouridation, Ion Exchange, Ultra filtration.

Solid Waste Management; Sources, composition and properties of solid waste- Collection and handling – Separation and processing- Disposal methods

Term Work

The term work shall consist of journal giving details of minimum six experiments:

Part-I

1. D.O.

2. B.O.D.

3. C.O.D

4. Solids: Total solids, suspended solids, fixed solids, volatile solids

5. S.V.I

6. Determination of phosphates by spectrophotometer

7. Determination of oil and grease

Part-II

Detailed design of Effluent treatment plant based on the characteristics determined in Part-I

Visit report of industrial waste water treatment plant

Reference Books:

Sewage Disposal and Air Pollution Engineering: S.K.Garg, Khanna Publications

Waste Water Engineering: B.C.Punmia and Jain – Arihant Publications.

Water Supply and Sanitary Engineering: G.S.Birdie and J.S.Birdie, Dhanpat Rai and Sons

Environmental Engineering: Davis – Mc Graw Hill Publications

Environmental Engineering: Peavy, Rowe- Mc Graw Hill Publications

Solid waste Management: P.Aarne, Vesilind, William, A. Worrell0

Elements of Environmental Engineering, K.N.Duggal, S.Chand and Co. Ltd.

WATER RESOURCES ENGINEERING – II (4002)

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs / week	Theory = 100
Practical: 2 Hrs / week	PR/Oral = 25
Duration = 3Hrs	T/W=25

1. Reservoir planning: Reservoirs types, investigation of site and selection , storage Capacity estimation mass curve, fixing various control levels and height of dams and economics.

2. Dams in General,- Classification, site selection, choice of types and Instrumentation in gravity dams.

Gravity dams and Earth dams: Forces acting, modes of failure, stability analysis, design of low and high gravity dams, galleries, joints, keys and water seals, control of cracking in concrete dams.

Earth Dams : Types , components and their functions , causes of failure ,design criteria, stability analysis , seepage and its control through earth dam and its foundation , drainage of earth dam , maintenance of earth dam.

3. Arch dam and buttress dams: Types and suitability, forces acting and design methods of arch dams, Buttress dam and types of buttress dams.

4. Spillways and Canal: Types and suitability under different conditions, construction features, design criteria, energy dissipation and I.S. recommendations, spillway gates. Canals: Classification, factors influencing alignment cross sections, design of canal in non alluvial soils, Kennedy's and Lacey's silt theories.

5. Canal masonry works: C.D. Works purpose, types, suitability, components and hydraulic design, design of transitions. Canal falls: Necessity location, types and design , regulating works, energy dissipation, roughening devices. Head and cross regulators : Construction features and hydraulic design..Modules: Functions , requirements, types and hydraulic design.

6. Diversion weir head works Dam outlets and Intakes: Introduction, Site selection, components, weir, barrage, design criteria for weirs & barrages, Bligh and Khosalas theory, corrections weir head regulator under sluices, divide walls, functions of components and design criteria. Types of weir and suitability causes of failure design of weirs Dam outlets and intakes: Types and construction features, design principles.

Term Work

Term work shall be based on syllabus and following assignments (any six)

1. Exercise on flood routing by any one method.

2. Multiple step method of high dam design.

3. Slip Circle analysis for upstream slope of earth dam.

4. Analytical method of locating pheratic line and trial sketching of flow nets for homogeneous sections.

5. Design of spillway crest and d/s ogee shaped profile.

6. Design of any one energy dissipater with respect to recommendations.

7. Design of diversion weirs, components.

8. Designing a canal by using silt theories.

9. Designing of any C.D. works.

10. Design of any one type drainage arrangement for earth dam.

11. Demonstration of stress distribution around openings by photo elastic methods.

Practical Examination:

The practical examination shall consists of performing an experiment based on the practical work done during the course , the record of experiments submitted by the candidate and viva-voce based on the syllabus. The assessment will be based on Performing an experiment. Record of experiments submitted by the candidate.

Viva-Voce based on the syllabus.

REFERENCE BOOKS :

1. Water Resources Engineering: Punmia & Pande.

2. Water Resources Engineering: Santoshkumar Garg.

3. Water Resources Engineering: Birdie Dass.

4. Design of irrigation structures: S.K.Sharma.

5. Engineering of dams Vol. I , II, II : Creages, Justin and Hinds.

6. Water Resources Engineering: Wurbs R.A. and James W.P. –Prentice Hall of India Pvt.Ltd, New Delhi.

7. Irrigation water resources and water Power Engineering—Modi P.N. Standard book House, Delhi.

DESIGN OF STRUCTURES – III (4003)

Theory Lect. – 4 hrs/week Theory 100 Marks

Duration 04 hrs

1. **Design of combined footings :** Rectangular footing, Trapezoidal footing. [6 hrs]
2. **Design of Circular slab** [4 hrs]
3. **Design of Flat Slab :** Introduction – component of flat slab construction, IS code recommendation, Direct design method and Equivalent frame method [6 hrs]
4. **Design of Cantilever and Counterfort retaining wall** [5 hrs]
5. **Water tanks :** Elevated circular and rectangular tanks with [5 hrs]

   flat bottom and top
6. **Introduction to Prestressed concrete :** principle of prestress, Basic concepts, comparison between Prestressed concrete and Reinforced Concrete, Need of

   high-strength concrete and Steel for Prestressed concrete construction [4 hrs]
7. **Classification of prestessed concrete member, System of prestressing** [3 hrs]
8. **Losses :** Loss of prestress due to shrinkage, creep, elastic shortening of concrete slippage of wires and deformation of anchorages, relaxation of steel and friction. Computation of losses [3 hrs]
9. **Formwork :** Introduction, loads on formwork, Indian standards on formwork, design of shuttering for columns, beams and slab floor. [4 hrs]

Reference Books:

RCC Designs (Reinforced Concrete Structures) by Dr. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain.

1. Illustrated Reinforced concrete design by Dr. S.R. Karve and Dr. V.L. Shah.
2. Reinforced Concrete Design by – Pillai, S. Unnikrishna.
3. Prestressed Concrete by N. Krishna Raju.
4. Prestressed Concrete by T.Y. Lin.

Refer IS 456-2000 and IS 1343-1980.

FOUNDATION ENGINEERING (4004)

(Geotechnical Engineering)

Theory : 100 marks | Lectures : 4 hrs./week

Time : 3 hrs. | Total 40 lectures

Section – A

Location Characterization & Analytical Techniques

1. Site Investigation (Location characterization)

Need to investigate, investigation methodologies such as Geophysical & Remote sensing, Drilling technologies, Pits-trenches & shafts, In-situ & laboratory testing, Sampling Techniques, Presentation of results of site investigation. (5 hours)

2. Analytical Techniques – (A)Bearing Capacity Analysis

Failure mechanism in shallow and deep foundations, Terzaghi's theory & generalized Bearing capacity equation, shape factors, depth factors, inclination factors, ground slope factors & base tilt factors. Use of the equation for strip, square & rectangular footings. Determination of bearing capacity from field tests by using N-values, Using qc values, plate load test & its limitations, Standard Penetration Test (SPT). Factors affecting bearing capacity of foundation bed. Effect of water table and loading eccentricity on bearing capacity. (6 hours)

(B) Settlement Analysis

Stress distribution, consolidation settlement, immediate settlement, Study of Elastic mechanism, undrained case for clays and drained case for sands.

Corrections to computed settlements – Rigidity of the footings, location of footing below ground water surface, variability in E and μ. (5 hours)

(C) Earth Pressure Analysis

Lateral earth pressure, States of failure, Rankine's Theory, Coulomb's Theory, Culmann's method, various factors affecting Lateral Earth pressure.

Calculation of earth pressures under drained and undrained conditions. Tension cracks & height of unsupported cut. (4 hours)

Section – B

Engineering Design & Ground Engineering

1. Sub-structures foundation

Loads, types of foundation, Design criteria for Acceptable settlement & acceptable safety against Bearing capacity failure. (2 hours)

Geotechnical & Structural Design

I) Design water Table level, II) Design Soil Parameters (1 hour)

Geotechnical design for Shallow foundation such as foundation level, shape & range of widths, settlement & bearing capacity Analysis, Results & recommendations. Geotechnical design for deep foundations (2 hours)

Identifying a strong Bearing layer for location of pile tip, selection of its type, range of pile lengths & dia. Axial capacity analysis & settlement analysis. (3 hours)

2. Earth Structures : Dams & Embankments

Types of earth structures, types of Earth dams, components of earth dams such as – core, shell, cut-off Barrier, transition filters, internal drains, protective layers for control of erosion & toe drainage. Design criteria & process, choice of parameters, construction & quality control. Road, rail & other embankments. (4 hours)

3. In-situ Densification of soils

Response of sands & clays to externally applied stress, compaction piles in sands, Impact compaction of sands, vibratory compaction in sands, vibroflotation. (2 hours)

4. Foundations on Black Cotton Soil

Characteristics of B. C. soils, problems of foundations in B.C. soils, foundation techniques in B.C. soils. (3 hours)

5. Geosynthetics

Why geosynthetics, types of geosynthetics, functions, properties & functional requirements, Designing with Geosyntehtics. (3 hours)

Text Books :

1. Geotechnical Engineering by S.K. Gulathi (Tata Mc-Graw Hill, New Delhi)

2. Soil Mechanics & Foundation Engineering by B.C. Punmia (Laxmi Publications Pvt. Ltd.) March 2005

Reference Books

1. Foundation Design by W.C. Ten

2. Foundation Engineering by Dr. B.J. Kasmalkar

(Pune Vidyarthi Griha Prakashan, Pune)

TOWN PLANNING (Elective- I) (4005)

Teaching Scheme	Examination Scheme
Lectures : 4 Hrs / week	Theory = 100
Practical : 2 Hrs / week	T/W = 50
	PR/Oral = NIL
	Duration = 3Hrs

Evaluation Of Town Planning: Ancient towns in India, Great Britain and other major countries, pre-mediaeval, mediaeval and later towns. Industrial revolution and effect on town planning, sanitarium and public health of G.B. Town planning and housing Act of G.B (1909). Utopian plan for towns, garden cities, Satellite Towns, Barlaw reports (G.B) and twentieth century developments in other Countries and India, Post independence problems in India.

Fundamentals Of Planning: National planning, regional planning, local planning, Surveys and data collection for regional and Town Plans, Sources and methods of gathering information, land use survey population base and projection, services and amenities, density and Floor Space Index, Zoning.

Urban Transport: Traffic Engineering - Traffic Study, Improvement of traffic facilities, road intersections and its optimum use, congestion and parking, Traffic Control Devices, Refuge Islands, Rapid Transit Systems.

Town Planning And Industries: Location of Industries, conurbations, Zoning of industries, Noise, Air Pollution, Services Transport and other facilities.

Town Forms Layout: Circular towns, Star shaped Towns, Linear Towns, Radial and Grid Iron Patterns, Treatment for growing towns, considerations of a development plan, Master plan, layout considerations. Basic elements of a town plan neighborhood unit, standards of housing, Traffic circulation, Tree Planting and Land Scaping, Schools, Parks and open spaces, Medical, Shopping and other facilities, factors limiting expansion of towns.

Urban Renewal And Redevelopments: Problems of slums and improvement, urban explosion and its problems dilapidated localities, traffic problems, optimum city population, Ecological and Sociological aspect of town planning.

Building Byelaws: Introduction of minimum plot areas, road width, open space, Byelaws of Municipal Corporation applicable to residential and commercial buildings.

TERM WORK:

Planning of Township with all amenities.

REFERENCE BOOKS :

1. Town and Country planning and housing	By Modak & Ambdekar
2. Urban Pattern	By Gallion etc.
3. Town and Country planning	By M.K. Gandhi

COMPUTER APPLICATION IN CIVIL ENGINEERING

B.E. (CIVIL) Elective – I

Theory : 100 marks | Term work : 50 marks

Time : 3 hrs. | Lectures : 4 hrs./week

Practical : 2 hrs./week

TOPICS :

1. Finite Difference method :

   Introduction, development of finite difference equations & operators, applications of this method in the analysis of columns, beams, slab, plate problems (for static flexure, vibrations & buckling).

1. Finite Element method :

   General principles, discritization of continuum, element nodes, displacement functions, convergence criteria, shape functions, natural co-ordinate system, plane stress, plane strain problems, development of element stiffness matrix for beam element, triangular element, rectangular element using explicit isoparametric formulation. Assembly of element stiffness matrices, application of FEM to simple one & two dimensional problems, analysis of flow nets using FEM.

2. Curve fitting & Integration :

   Fitting polynomial curve to given data, parabolic & experimental curve fitting applications to surveying, water resources, transportation engg. Problems, Newmark's method of Integration, its application to buckling of simply supported columns, beams etc.

3. Matrix method :

   Stiffness & flexibility matrix methods of analysis of simple & continuous beams & frames. Use of MS-Excel worksheets for analysis of beams using stiffness & flexibility methods. Use of STAAD-PRO, SAFE & ETABS software.

4. Miscellaneous topics & Applications:

   Normal, Poisson & Beta distributions, design of retaining wall, design of gravity dam, design of pipe culvert, slab culvert or box culvert, stability analysis of abutments/piers, design of well foundation, bearing capacity determination, design of rigid pavement.

Term work :

Term work shall consist of used of assignment two on each topic mentioned above & solution of problems using computer programme in FORTRAN or 'C' language. Analysis & report of G+1 R.C.C. structure using STAAD-PRO.

Reference Books :

1. Finite Element method - by O.C. Zuikiwich
2. Numerical methods for engineering problem - by K. Raju & Murthy
3. Design of Bridge structure - by T.R. Jagdish
4. Analysis of framed structures - by Gere & Weaver
   (Matrix Analysis of Structures)

Finite Element method - by Desai & Abel.

PRESTRESSED CONCRETE (Elective- I)

Lectures : 4 Hrs / week **Theory = 100**

Practical : 2 Hrs / week **Term Work = 50**

Duration = 3Hrs

1. Application of limit state method of design of prestressed concrete elements. (2)

2. Design of section for tension , compression , flexure, shear and bond by limit state method. (8)

3 Design off end blocks by different methods. (6)

4 Design of one way and two way prestressed slabs. (6)

5 Linear transformation and concordant cables. (6)

6. Circular prestressing. (4)

7 Analysis of composite section. (4)

8 Design of prestressed concrete poles and railway sleepers. (I.S. 1343 will be allowed to use in theory examination.) (4)

Term Work

It shall consist of

1. The solutions of at least six examples based on topics from the syllabus.

2 Design and detailing of simple prestressed concrete structure.

Term Work Examination:

The assessment of the term work shall be done on the following criteria :

1. Continuous assessment
2. Oral examination conducted internally on the syllabus and term work mentioned.

REFERENCE BOOKS:-

1. Prestressed concrete : Krishna Raju

2. Design of Prestressed structures :T.Y.Lin

3. The mechanics of prestressed concrete structures : Malik & Ramaswamy

PROJECT WORK – 1 (4006)

Pract: - 2 Hrs **Term Work Marks – 50**

TERM WORK:-

Term work will consist of a preliminary report related to the project work to be completed under Project – II (For the second term). The students are required to submit the outline of project along with review of literature and relevant data, while selecting the topic the emphasis should be given to research field application and trends in the construction industry. The group of 5 to 6 students will work on one topic. The same group will continue the project work, on the topic of Project-I in second term for Project -II

The preliminary report shall consist of minimum 25 pages. The extract or copies of the literature, wherever available, may enclose in the report.

Term Work Examination:-

The term work will be assessed by two internal examiners appointed by the Principal at the presentation talk on the preliminary report.

The term work assessment is based on the following.-

1. Continuous assessment
2. The report submitted.
3. Presentation talk

SEMINAR – I (4007)

Practical Exam – 50 Marks

Students should work on a various Civil Engineering construction sites such as R.C.C. Structures, Steel Structures , Bridges, Culverts, Hydraulic structures water tanks, Roadwork's, Railways, Water supply and sanitary work technical Exploration, Maintenance and Rehabilitation works, Irrigation system, Formwork, Reconnaissance and Detailed Surveying & leveling etc.

The Detailed Report should mainly consist of the following:

1. Name of construction site with address.
2. Nature of construction work and various structural components.
3. Nature of ownership, executing and supervising authority.
4. Architect and Structural Engineer
5. Architectural concept and Design features
6. Commencement of the work and tentative completion
7. Present Status of work
8. Estimated cost of the work (money spent till date)
9. Mode of availability of finance
10. Various types of manpower for the work
11. Various safety measures and amenities provided to manpower
12. Various construction equipments for the work
13. Various materials used for the work
14. CPM/PERT of the project
15. Type of inventory control
16. Recourses planning implemented
17. Social benefits and implication
18. Safety measures during and post construction
19. Post construction maintenance provisions
20. Effect on environmental aspects and sustainable development
21. Various types of scaffolding, Formwork, lifting devices.

22. Site of precast units for the work and its mode of transportation
23. Use of local available material like fly ash, slag, silica-fumes etc
24. Causes for delay / faulty construction.
25. Causes of Arbitration.

A technical report will contain the work experience, of student for the period of implant training. This will contain the information about the project on which the training is given and also the certificate from the project head for satisfactory completion of training. The presentation talk on the implant training will be assessed by internal examiner and the external examiner appointed by the University.

STRUCTURAL MECHANICS (4008)

Lectures : 4 Hrs/week

Theory : 100 Marks.

Duration : 3 Hrs.

1. Theory of elasticity, strain displacement relation, strain compatibility equations, stress equilibrium equations under static and dynamic conditions. Hooke's law, plane strain and plane stress conditions and their stress compatibility equations. Principal planes and principal stress in 3-D elasticity. 8 Hrs.

2. Laterally loaded plates with small deflection theory, governing differential Equation according to Kirchhoff's thin plate theory, cylindrical bending of thin rectangular plates. Navier's solution of rectangular plate subjected to single sinusoidal load and UDL.

   4 Hrs

3. Bending analysis of circular plates : Governing differential equation and general solution. Circular plate subjected to point load and UDL. Plate with a circular hole at the center.

   4 Hrs

4. Membrane theory of thin cylindrical shells, Spherical and conical domes/shells.

   4 Hrs

5. Flexibility matrix method : flexibility coefficient, compatibility conditions, Applications to beam and portal frames. 5 Hrs

6. Stiffness Matrix method : stiffness coefficient, application to continuous beam & single bay single storey portal frames. 5 Hrs

7. Introduction to structural dynamics single degree freedom system, undamped system, damped system, dynamic load factor, sinusoidal dynamic loading, typical impulsive support motion. Earthquake response of linear systems. 6 Hrs

8. Rayleigh-Ritz Method : Introduction, Potential Energy Theorem, displacement Function, application to axially loaded members and beam bending problems 4 Hrs

Reference Books. :

1. Theory of Elasticity – Timoshenko & J.N. Goodier
2. Theory of Elasticity – Dr. Sadhu Singh
3. Theory of Plates & Shells – Timoshenko S.P. & Krieger S.W.
4. Design and Construction of Concrete Shells Roofs – G.S. Ramaswamy
5. Analysis of Framed Structures – J.M. Gere & W. Weaver Jr.
6. Structural Analysis – G.S. Pandit & S.P. Gupta
7. Advance Theory of Structure – N.C. Sinha & P.K. Gayen
8. Theory of Structures – II – H.M. Somayya
9. Structural Dynamics – Mario Paz
10. Dynamics of Structures – A.K. Chopra

TRANSPORTATION ENGINEERING - II (4009)

Teaching Scheme	Examination Scheme
Lectures : 4 Hrs / week	**Theory : 100**
Practical : 2 Hrs / week	**T/W : 25**
	PR/Oral : 25

Duration : 3 hrs.

1) **Highway Planning and Financing**: Historical developments, classification of roads, planning surveys, preparation of master plan & its phasing, Nagpur plan, Bombay plan, Lucknow plan, (only salient features of these three plans, no numerical is to be asked in examinations), Vision 2021- details of recommendations, highway cost, highway user benefits, highway economic analysis, highway financing, private sector participation, National Highway development Programme, development of rural roads through PMGSY, National highway development authority, Indian road congress.

2) Highway Alignment and Geometric Design: Highway Alignment, Engineering

Surveys, highway cross- section elements, width of formation, sight distances, design of horizontal and vertical alignment including curves, super elevation, extra widening. Set back distance, gradients, alignment & geometrics of hill roads (IRC recommendations should be followed).

3) Highway Materials:

soil and its characterization, CBR test , plate bearing test, aggregates, gradation and other tests bituminous materials and different tests on them, bituminous mixes and mix design procedure, cement concrete and their properties.

4) Design of pavement :

a) Flexible Pavements : Design factors, different methods of design, CBR method, group index method, Burmister's method, Triaxial method, IRC 37-2001, drainage design for pavements.

b) Rigid Pavements : General design considerations, wheel load stresses, Westergrad's wheel load stresses formula, slab thickness for pavements, longitudinal and transverse joints, IRC 58-2002.

5) Pavement Construction: Construction of earth roads, stabilized soil roads, water bound Mecadam roads, wet mix Mecadam roads, bituminous macadam, semidence bituminous concrete, asphalt concrete, seal coat mix seal surfacing, liquid spray grout, constructions of cement concrete roads.(All procedures as per specifications for road and bridge works -Ministry of road transport & Highways, Govt. of India, fourth revision.) .Highway Construction Machinery Earth moving equipments, spreaders, rollers, paver finishers, binder sprayers, hot mix plant, vibromixes, tippers.

6) Highway maintenance : Causes of pavement failures, typical flexible and rigid pavements failure, special repairs in flexible pavements.

7) Traffic Engineering: Traffic characteristics, traffic studies & their uses, traffic control devices, intersections & their design.

8) Airport : Aircraft characteristics related to airport design, general layout of an airport, runway configurations, runway orientations, geometric design of airfields, runways and aprons, air traffic control, airport lighting and marking, air travel demand forecast.

9) Tunnel Engineering: Necessity, planning of tunnels, types of tunnels, alignment method of constructions, problems in tunnel constructions, tunnel lining, tunnel lighting, ventilation and drainage.

Term Work

Term Work shall consist of laboratory journal covering following laboratory tests (minimum 10) as prescribed below.

Test on soil -CBR test.

Tests on aggregates: impact, gradation, crushing, abrasion, shape, soundness, Specific Gravity and Water absorption Tests on Binders: penetration, viscosity, softening point, ductility, flash & fire point. Tests on bituminous mix: Marshall or Hubbard field test.

REFERENCE BOOKS : -

1. Highway Engineering : S.K. Khanna & Justo
2. Principals of transportation Engineering : Partha Chakraborty & Animesh Dass
3. Guidelines for the design of flexible pavements, second revision, IRC : 37- 2001
4. Guidelines for the design of rigid pavements, IRC : 58-2002
5. Specifications for road and bridge works, Ministry of Road transportation & Highways-2001, Govt. of India, New Delhi.
6. Highway Engineering : Kadiyali
7. Airport Engineering : G. Venkatappa Rao
8. Principles of transportation and highway engineering : G. Venkatappa Rao
9. Transportation Engineering Laboratory Annual : S.L Dhingra, G.V Rao

CONSTRUCTION MANAGEMENT (4010)

Lectures : 4 Hrs / week	**Theory = 100**
Practical : 2 Hrs / week	**Term Work = 25**
Duration = 3Hrs	**PR/Oral = 25**

1] Introduction : (2)

Importance of construction management, definition of construction project management, project goals, construction project manager's job description, responsibilities and rights.

2] Project planning and initiation: (2)

Break down of project, definition of planning, construction master plan project execution, formats for capital project construction, project initiation.

3] Construction project scheduling: (4)

Bar chart, procedure for development of bar chart, for large construction project, merits and demerits, mile stone chart.

4] Construction project networks techniques: (10)

Introduction to C.P.M, network representation, time estimates, cost optimization, project control, resources scheduling & application of P.E.R.T network in construction project.

5] Construction project safety and health & Energy Audit : (3)

Importance of safety to organization, types of tools used for safety of construction, employee on different construction projects. Electricity & other power utilized during construction project and it's audit.

6] Construction project communication: (3)

Definition, type of communication, effective communication, barriers in communication, remedial measures.

7] Human factor in construction management: (4)

Importance of man power in construction organization, man power requirements, merit rating, wage structure.

8] Construction equipments: (4)

Types of Construction equipments (earthwork and concreting), criteria for selection of Construction equipments on different sites, cost effectiveness computations.

9] Material management: (4)

Importance in construction projects. ABC analysis, inventory management, EOQ, problems on EOQ.

10] Computer application in construction management: (4)

Types and uses of software in construction management, introduction to primavera software. Application of MS-Project Management.

Term Work :

Term work should consists of record of assignments one above syllabus.

1. Assignment on bar chart for construction project.
2. Assignment on mile stone chart.
3. Network representation, assigning duration to various activities by considering available resources, computation of duration of project, cost optimization resources scheduling, uses of computer programming.
4. Inventory control related with construction project.
5. Problem on ABC analysis
6. Assignment for as small residential building on MS-Project Management software

REFERENCE BOOKS:-

1. Construction management : Harpal Singh

2. Total Construction Planning Management : George J. Ritz , Mc Graw Hill

3. CPM & PERT : Punmia

4. Industrial Engineering & Organization : O.P Khanna

5. Construction equipments : Purify, Mc Graw Hill publication.

Software : Microsoft Project- 2008 or later version.

Advanced Structure (Elective -II)

Time-4 Hrs. Theory- 100 Marks
Lect.-4 Hrs. Term work- 50 Marks
Pract. Hrs.-2 Hrs

1.	Raft foundation	04
2.	Pile foundation , group piles, pile cap design.	04
3.	Beams curved in plan - Analysis & design	06
4.	Deck slab & girder bridges	06
5.	Folded Plates - Analysis & design Procedure	04
6.	Transmission Towers - Introduction & load calculation	04
7.	Multistoreyed Frames – Cantilever method , Portal method, Substitute frame method	06
8.	Yeild Line Theory- Introduction ,Assumption, Yeild line patterns, Yeild Moment, Ultimate load by virtual work method & Equilibrium method for square & rectangular slab	06

Term Work :

Term work shall consist of record of set of six exercises and minimum two drawings on the syllabus.

Term Work Examination:

The assessment of the term work shall be done on the following criteria's.

1) Continuous assessment
2) Oral examination conducted internally on the syllabus & term work mentioned.

Reference Books:

1) Reinforced Concrete – Sinha & Roy
2) Design of RCC shells – G. S. Ramaswamy
3) Theory & design of concrete shells – B.K.Chatterjee
4) RCC design – B.C.Punmia & A.K.Jain
5) Advanced structures – Krishna & Raju
6) Concrete structures – Vazirani & Ratwani

INDUSTRIAL WASTE TREATMENT (Elective II)

Theory – 100 Marks **Term Work – 50 Marks**

Time: 3 Hrs. **Practical – 2 Hrs/week**

Lect. – 4 Hrs/week

PART – I

1. Stream Pollution :- Physical, Chemical & Biological Pollutants: Natural System of stream purification; Streeter & Phelphs DO – model; Oxygen sag curve; Whipple Ecological model; Problems on DO – Model.
2. Water pollution Control Acts :- Need & Importance; Central & State Pollution Control Boards, Functions & Responsibilities. Maharashtra Pollution Control Act; ISI effluent standards for disposal of Industrial wastes.
3. Volume reduction & strength reduction of Industrial waste; Bye product recovery; Equalization & Neutralization. Importance; Necessity ; Suitability.
4. Introduction to EIA, Importance; utility of EIA, Scope of EIA, EIS; Zoning of Industries; Economics of ECO – Development. Environmental inventory, Environmental Audit. Energy audit of Industries.

PART II

1. Detailed study of the following Industries W.R.T. manufacturing process : Characterization of waste : Suitability of treatment unit.

   i. Sugar Industry.
   ii. Paper and pulp. Industry.
   iii. Tannery Industry.
   iv. Dairy Industry.
   v. Pharmaceutical Industry.
   vi. Cotton Textile Industry.
   vii. Breweries Industry.
   viii. Electro Plating Industry.
   ix. Distillery.

2. Design of Biological Treatment unit : Based on Kinetics.

   i. Activated sludge process.
   ii. Oxidation pond
   iii. High rate Anaerobic filters.
   iv. Up flow Anaerobic sludge blankets reactors.

3. Advanced waste water treatment systems.

   i. Chemical Precipitation.
   ii. Air stripping
   iii. Electro dialysis.
   iv. Ion – Exchange.
   v. Reverse Osmosis.
   vi. Nitrification & Denitrification.

4. Radio Active wasters; Treatment & Disposal methods. Environmental impacts of Radioactive wastes.

TERM WORK:

Characterization of waste water in any two of the industries mentioned in Part – II of the syllabus. Interpretation of Results; Design of suitable treatment system; based on characterization of waste water.

Visit to minimum of three industries, mentioned in the syllabus submission of detailed report on manufacturing process; Existing treatment facilities.

TERM WORK EXAMINATION:

The assessment of the term work shall be done on the following criteria's.

i. Continuous assessment
ii. Performing the experiments in the laboratory.
iii. Oral examination conducted internally on the syllabus and term work mentioned.

REFERENCE BOOKS:

1. Industrial waster treatment and practice – N.L. Nemarov.
2. Industrial treatment processes and control – Eckenfieldor.
3. Waste water treatment; disposal & reuse – Metcalf & Eddy.
4. Environmental Engineering – Peavy , Howard & Technologlous.
5. Waste water Engineering – M.N. Rao & A.K. Dutta.
6. Manual of Industrial waste Treatment – NEERI, Nagpur.

GEOGRAPHICAL INFORMATION SYSTEM (Elective – II)

Teaching Scheme	Examination Scheme
Lecture 4 Hours / Week	Theory: 100 Marks
Practical: 2 Hours /Week	Term Work: 50 Marks

Unit I

GIS: Introduction, GIS definition and terminology, GIS categories, Components of GIS, Geographic data presentation: mapping process, coordinate systems, transformations, map projection, geo referencing fundamental operations of GIS, A theoretical framework of GIS.

Unit II

Types of data representations: Data collection and input overview, data input and output, Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS- File management, spatial data- layer based GIS, feature based GIS mapping.

Unit III

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

Unit IV

Water Resources Applications: Land use / Land cover in water resources, surface water mapping and inventory, Rainfall – runoff relations and runoff potential indices of water sheds. Flood and Draught impact assessment and monitoring, Water shed Management for sustainable

development and water shed characteristics, Drainage morphometry, Inland water quality survey and management. Water depth estimation and bathymetry.

Environment Monitoring Applications: Natural hazard management, Urban planning in Natural Resource Management, Land information

Practical

Arc-Info and Arc-View practice and ILWIS

Creation of different spatial layers

Map analysis

References

1. S.Kumar. Basics of Remote Sensing & GIS, Laxmi Publications.
2. Jhon Wiley and Sons. Fundamentals of GIS BY Mechanical Designs.
3. M.Anju Reddy, JNTU, Hyderabad.

Elective II – EARTHQUAKE ENGINEERING

Teaching Scheme :

Theory: 4 Hrs. / Week

Practical: 2 Hrs. / Week

Examination Scheme :

Theory Paper: 100 marks (3 hrs.)

Term work: 50 marks

1. Engineering Seismology: Causes of earthquakes, seismic waves, magnitude, intensity, energy release, characteristics of strong earthquake ground motions. (4 Hrs.)
2. Introduction to theory of vibrations, flexibility of long and short period structures, concept of response spectrum. (4 Hrs.)
3. Building forms for earthquake resistance. (4 Hrs.)
4. Seismic design philosophy, performance of buildings in past earthquakes. (4 Hrs.)
5. Equivalent static lateral earthquake force, study of IS 1893. (4 Hrs.)
6. Seismic design of Masonry buildings, RC buildings, Study of IS 4326, IS 13827, IS 13828, IS 13920. (4 Hrs.)
7. Seismic effects and liquefaction. (4 Hrs.)
8. Theory of vibrations, Single, two, multi degree of freedom systems, Response Spectrum Analysis. (4 Hrs.)
9. Concept of seismic design: Reduction factors, over strength, ductility, redundancy. (4 Hrs.)
10. Concepts of base isolation and energy dissipative devices. (4 Hrs.)

TERM WORK

Each student will be required to submit assignments on each of the topics mentioned in the syllabus.

The assessment of term work shall be done on following criteria.

1. Continuous assessment.
2. Oral examination conducted internally on the syllabus and the term work mentioned above.

RECOMMENDED BOOKS

1. Earthquake Engineering By D.S. Joshi
2. Structural Dynamics By Biggs.
3. Structural Dynamics By Anil Chopra.
4. BMTPC Earthquake Engineering Tips.
5. Earthquake Engineering By Chandrashekharan

Note: The distribution of marks in the question paper should be based on the proportion of teaching hours allotted to each topic.

Elective II – PAVEMENT ENGINEERING

Theory : 100 marks | Term work : 50 marks

Time : 3 Hrs | Practical : 2 Hrs / Week

Lectures : 4 Hrs / Week

TOPICS :

1. Pavement Material characterization : Soil characterization & tests, CBR test, Plate bearing test, stone aggregates-source, characterization, tests, gradation batch mix problems, Bituminous material- source, composition, characterization, tests on bituminous binder, Bituminous Mixes- Mix volumetric, mix design, stiffness modulus & fatigue performance of bituminous mixes, cement-source, tests, cement concrete.
2. Pavement Analysis : Pavement composition, parameters for pavement analysis, analysis of bituminous pavement structures, analysis of concrete pavement structures.
3. Design of flexibility pavement : Design parameters, design philosophies- CBR method, California method, Regression method, Mechanistic method, present trends in pavement design, asphalt institute method, road note-29 method, AASHTO design method, IRC method, Japan Roads Association method, Design of drainage layer.
4. Design of Rigid pavement : Stresses in concrete pavements, current Indian procedure, AASHTO method, British method, Joints in concrete pavements.
5. Design of Overlays : Types of overlays, design of flexible overlays over flexible pavement-static load, AASHTO method, design of flexible overlays on rigid pavements, design of rigid overlays over rigid pavements, Design of rigid overlays over flexible pavements.
6. Pavement construction : Construction of wet mix Macadam, granular sub-base, bituminous construction, built up spray grout, bituminous Mecadam, bituminous surface courses, construction of concrete pavements, joint fillers & sealers.
7. Pavement Evaluation & Maintenance : Functional evaluation, international roughness index, skid resistance, rough measuring equipments, structural evaluation & equipments, Distresses in pavement –different types, pavement maintenance, measures with overlay & other than overlay.

8. Pavement management systems : Application of PMS, components of PSM, evaluation of pavement condition data, highway development management tool, use of computers in highway engineering.
9. Airport Pavement Design & Heliports : Federal Aviation administration method, U.S. army Corps of engineer (USACE) method, load classification method, ACN PCN method, classification of heliports & Geometric & structural design of heliports.
10. New Road construction materials : Modified bitumen, Geotextiles, geosynthetic, fly ash & earth reinforcement, reinforce concrete as pavement material, pavement quality concrete, CRMB rubber technology.

TERMWORK :

Term work shall consist of laboratory journal covering following experiments & design examples (any ten)

1. CBR test
2. Marshal test
3. Benkalman beam test
4. CBR test with geosynthetic materials in soil
5. Road roughness evaluation test
6. Design of flexible pavements
7. Design of rigid pavements
8. Design of overlay
9. Design of drainage layer
10. Visit to road construction site & detail report of it
11. Visit to hot mix plant & detail report of it
12. Use of any software for estimating road quantities
13. Visit to airport & detail report of it

REFERENCES :

1. Highway Engineering by S.K. Khanna & Justo
2. Principles of transportation Engineering by Partha Chakroborty & Animesh Dass
3. Guidance for the design of flexible pavements, Second revision, IRC : 37-2001
4. Guidelines for the design of rigid pavements, IRC : 58-2002
5. Specifications for road & bridge works, Ministry of Road transportation & Highways – 2001, Govt. of India, New Delhi.
6. Highway Engineering by Kadiyali
7. Airport Engineering by G. Venkatappa Rao
8. Principles of Transportation & Highway engineering by G. Venkatappa Rao
9. Transportation Engg. Laboratory Manual S.L. Dhingra, G.V. Rao

PROJECT WORK – II (4012)

Practical: - 4 Hrs **Term Work – 50 Marks**

Practical– 100 Marks

This is an extension of the work already done by the student in first term in Project – I. The student shall complete the work of analysis of the collected data if any, design and drawing.

The student shall submit a report of the work carried out in respect of the project assigned including analysis designs and drawings.

Practical Examination:-

The student shall bring the report of project –I and Project – II at the practical examination. The practical examination shall consist of practical / oral examination based on the project reports. The examination will be conducted by a panel of two examiners, internal examiner and the external examiner appointed by the University. The practical examination will be based on following:-

1. Continuous assessment
2. The report submitted
3. Presentation talk

SEMINAR - II (4013)

Practical: - 2 Hrs **Term Work – 50 Marks**

The student individually shall study some special topic beyond the scope of syllabus under the subjects of Civil Engineering branch from current literature, by referring the current technical journal or reference books, under the guidance of a teacher.

The student shall prepare his report together with design computation, sketches, drawings etc. If any, and deliver a talk on the topic for other students of his call in the presence of his guide and internal examiner. The student is permitted to use audio visual aids or any other such teaching aids.

Term work and term Work Examination:-

The report, written in technical reporting manner and presentation of the talk on the subject and will be treated as term work under this subject and will be assessed by two internal examiners appointed by the principal of the institution: one of whom will be his guide and the other internal teacher of the concerned branch.