



SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognised by AICTE, New Delhi)

Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA

Recognised as Scientific and Industrial Research Organisation

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R17)

IV/IV B.TECH

(With effect from **2017-2018** Admitted Batch onwards)

CIVIL ENGINEERING

(Accredited by NBA)

I-SEMESTER

Code No.	Name of the Subject	Credits	Lect Hrs	Tutorial Hrs	Lab Hrs	Contact Hrs/Week	Internal Marks	External Marks	Total Marks
B17 CE 4101	Transportation Engineering-II	3	3	1	-	4	30	70	100
B17 CE 4102	Water resources Engineering-I	3	3	1	-	4	30	70	100
B17 CE 4103	Project Planning & Management	3	3	1	-	4	30	70	100
#ELE-I	Elective-I	3	3	1	-	4	30	70	100
#ELE-II	Elective-II	3	3	1	-	4	30	70	100
B17 CE 4112	Highway Materials Testing Lab	2	-	-	3	3	50	50	100
B17 CE 4113	Computer Applications in Civil Engineering Lab	2	-	-	3	3	50	50	100
TOTAL		19	15	5	6	26	250	450	700

#ELE-I	B17 CE 4104	Finite Element Methods of Analysis
	B17 CE 4105	Solid Waste Management
	B17 CE 4106	Expansive Soils
	B17 CE 4107	Traffic Engineering
#ELE-II	B17 CE 4108	Prestressed Concrete Structures
	B17 CE 4109	Ground Improvement Techniques
	B17 CE 4110	Transportation Planning
	B17 CE 4111	Urban Hydrology

TRANSPORTATION ENGINEERING – II

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: The aim of this course is to acquire sound knowledge on Components of Railway Engineering, Geometric Design standards, Interlocking & Signaling Systems, Airport Planning and Design and Technical components of Harbours.

Course Outcomes: At the end of the course, the student will be able to:

S. No	Out Come	Knowledge Level
1	Illustrate the different types of Components of Railway Engineering	K2
2	Plan the Geometric Design for a Railway Track	K3
3	Characterize the concepts of railway Interlocking and signaling systems	K4
4	Identify the technical issues related to planning and design of airports	K3
5	Distinguish the technical components of harbours	K4

SYLLABUS**UNIT-I**

Components of Railway Engineering: Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

UNIT-II

Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves

UNIT-III

Turnouts & Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling Train Movement – Interlocking – Modern signaling Installations.

UNIT-IV

Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT-V

Planning, Layout, Construction and Maintenance Of Docks and Harbours: Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids

Text Books:

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora - Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. - Dhanpathi Rai & Sons, New Delhi.

Reference Books:

1. S.P. Bindra, “A course work in Docks and Harbour Engineering”, Dhanpat Rai Publications Pvt., Ltd, New Delhi, 2003
2. S.P. Bindra, “A course in bridge, tunnel and railway engineering”, Dhanpat Rai Publications Pvt., Ltd, New Delhi, 1996
3. Ahuja and Birdi, “Roads, railways, bridges and tunnels engineering”, Standard Book House, New Delhi, 2000
4. R. Srinivasan, “Dock, Harbour and Tunnel Engineering”, Charotar Publishing House, Anand, 1989
5. S.C. Rangwala, “Principles of Railway Engineering”, Charotar Publishing House, Anand, 2000.
6. Transportation Engineering-II, NPTEL video lectures.

WATER RESOURCES ENGINEERING-I

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives:

Student may know the Major hydrologic components & apply key concepts to several practical areas of engineering hydrology & related design aspects, aquifer parameters & yield of wells, surface & subsurface investigation to locate ground water, storage capacity & life of reservoirs, the irrigation needs of crops.

Course Outcomes:

S. No	Out Come	Knowledge Level
1	Choose major hydrologic components & apply key concepts to several practical areas of engineering hydrology & related design aspects	K3
2	Determine aquifer parameters & yield of wells	K3
3	Carry out surface & subsurface investigation to locate ground water	K2
4	Determine storage capacity & life of reservoirs	K3
5	Assess the irrigation needs of crops	K5

SYLLABUS**UNIT-I****Hydrology:**

Hydrology in water resources development, Applications of Hydrology & Hydrological cycle. Precipitation – Types, Measurement of rainfall; Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data – Consistency of rainfall record, Double mass curve. Infiltration – Factors affecting and its determination, Infiltrimeters; Evaporation and Evapo - transpiration – Pan Evaporation

UNIT-II**Hydrological Aspects:**

Runoff –Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, Applications of Unit Hydrograph; S-hydrograph.

UNIT-III**Ground Water Flow:**

Definitions, subsurface distribution of water, ground water movement; Darcy's law; Permeability – Well hydraulics – Steady flow in different types of aquifers and wells; Determination of hydraulic properties of aquifer; Specific capacity of well; Well efficiency – Pumping tests –Introduction to tube wells and open wells.

UNIT-IV

Reservoir Planning:

Types of developments – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, Yield from a reservoir of given capacity; Economics of Water resources Projects –Apportionment of total cost of a Multi Purpose project, Reservoir Losses –Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation, case studies of reservoir failures.

UNIT-V

Irrigation:

Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Water extraction – Quality of irrigation water, Irrigation efficiencies — Water requirements of crops, Duty, Delta and Base period – Their relationship, Factors affecting duty and methods of improving duty, Consumptive use of water –Determination of evapo transpiration –, Assessment of irrigation water charges.

Text Books:

1. Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.
4. Engineering Hydrology, Subramanya, K., Tata McGraw-Hill Education Private Limited.

Reference Books:

1. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.
2. Impacts of climate change and climate variability on hydrological regimes, Jan C. van Dam, Cambridge University Press.
3. Hydrology: Principles, Analysis and Design, Raghunath, H.M.,New Age International.

PROJECT PLANNING AND MANAGEMENT

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives:

1. To understand the importance of project management in today's world.
2. To understand various project time estimates and costs for project planning
3. To understand the procurement process and the risks involved in different contracts
4. To establish the importance of Construction and scientific management

Course Outcomes:

S. No	Out Come	Knowledge Level
1	Apply the concepts of planning, scheduling and controlling to determine time estimates of the project	K3
2	Estimate the optimum cost –time relationship for the given project network	K5
3	Explain updating and resources allocation methods	K2
4	Make use of contracts and tender bidding procedures required for construction industry	K3
5	Apply the significance of project management for developing managerial skills	K3

SYLLABUS**UNIT – I**

PERT and CPM: Planning, Scheduling and controlling. Bar charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law : Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path.

UNIT – II

Cost analysis: Cost Analysis direct and indirect costs, operation time, Normal and crash points, optimizing project cost, crash limit, free float limit, Optimization.

UNIT-III

Updating/Resources allocation: Updating – Process of updating; when to update, Resource scheduling – Resource smoothening. Resource leveling, circle notation and arrow notation.

UNIT –IV

Contracts: – Element of contract, offer acceptance and consideration, valid contract, Department execution of works, Contract system with tenders – Definitions – Contract, Contractor, Quotation, Earnest money, Security money, Tender, Tender notice, Tender form, Reverse tendering, Bidding procedure, Irregularities in Bidding, award, Types of contracts – Lump sum contract; Lump sum and schedule contract, Item rate contract, sub-contracts, joint ventures, Arbitration Disputes and claim settlement, E-procurement.

UNIT V

Management: Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organization –Authority, Policy, Recruitment process and Training Development of Personnel Department. Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

Text Books:

1. PERT and CPM – L. S. Srinath.
2. PERT and CPM – Punmia.
3. Estimating and Costing – B.N. Dutta.
4. Construction Management and Planning – Guna and Sen Gupta, B

Reference Books:

1. Construction Project management, Theory & Practice- Jha, Kumar Neeraj
2. Project Planning with PERT and CPM - Punmia, B.C., Khandelwal, K.K

FINITE ELEMENTS METHODS OF ANALYSIS
(Elective-I)

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives:

Students learn

1. To learn basic principles of finite element analysis procedure.
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To learn and apply finite element solutions to structural problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.
4. Learn to model complex geometry problems and solution techniques.

Course Outcomes:

S. No	Out Come	Knowledge Level
1	Understand the concepts behind variational methods and weighted residual methods in FEM.	K2
2	Identify the application and characteristics of FEA elements such as bars, beams, 2-D element and axisymmetric element.	K2
3	Develop element characteristic equation procedure and generation of global stiffness equation will be applied.	K3
4	Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form	K3

SYLLABUS

UNIT-I

Introduction to finite element method, Equilibrium equations, strain – displacement relations, stress – strain relations, Compatibility equations, Variational and weighted residual methods, concept of potential energy, one dimensional problems.

UNIT-II

Discretization of domain, element shapes, discretization procedures, node numbering, mesh generation, interpolation functions, local and global coordinates, treatment of boundary conditions, assembly of stiffness matrix.

UNIT-III

Basic component: One dimensional FEM single bar element, Beam element: Derivation of stiffness matrix, Assembly of stiffness, Matrix boundary conditions, shape functions for 1 D elements, Initial strain and temperature effects, and trusses under axial forces.

UNIT-IV

Two dimensional FEM: Different types of elements for plane stress and plane strain analysis – Comparison of CST and LST elements, Derivation of CST stiffness matrix and equations, Initial strain and temperature effects, Problems on plane stress and plane strains in CST elements.

UNIT-V

Axisymmetric: Axisymmetric formulation, shape functions, strain-Displacement matrix, stress-strain relationship matrix, Element stiffness matrix, Problems on Axisymmetric, Applications in engineering structures.

Text Books:

1. Finite Elements Analysis by Dr. S. Senthil, R. Panneerdhass- Lakshmi Publications Chennai.
2. Finite Elements Methods in Engineering by Tirupati. R. Chandrupatla and Ashok D. Belegundu - Pearson Education Publications.
3. A first course in the Finite element method by Daryl L. Logan, Cengage learning India.

Reference Books:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E. Plesha. John Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C. S. Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India

SOLID WASTE MANAGEMENT
(Elective-I)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives: Student shall be able to:

1. Understand the terminology used to refer different types of wastes
2. Analyze the negative impacts of untreated solid waste on the environment
3. Acquire the knowledge of sanitary landfills, composts and incinerators.

Course Outcomes: By the end of the course, the student should be able to:

S. No	Out Come	Knowledge Level
1	Explain the quality of solid wastes	K2
2	Explain various functional elements of solid waste management	K2
3	Explain transport and segregation of wastes	K2
4	Explain the processing, composting and incineration methods of solid wastes	K2
5	Explain disposal methods of solid wastes	K2

SYLLABUS

UNIT – I

Introduction – Solid wastes and its types - Sources and Types of solid wastes – Characteristics of solid wastes: Physical, Chemical and biological characteristics- Problems due to improper disposal of solid waste.

UNIT – II

Solid Waste Management – Reduction, reuse, recycling and recovery principles of waste management – Functional elements of solid waste management – Waste generation and handling at source – Collection of solid wastes – Collection methods and services – guidelines for collection route layout.

UNIT –III

Transfer and Transport of Solid Wastes: Transfer station – Processing and segregation of the solid waste – Various methods of material segregation.

UNIT -IV

Processing and transformation of Solid Wastes: Composting – advantages- methods – Incineration and its methods – advantages and disadvantages of incineration.

UNIT V

Disposal of Solid Waste: Volume reduction - open dumping, land filling techniques, design and operation of land fills- land farming – deep well injection- energy recovery processes.

Text Book:

1. Integrated Solid Waste Management by Tchobanogous

Reference Book :

1. Environmental Engineering by Howard S. Peavy. Donald R.Rowe and George Tchobanogous

EXPANSIVE SOILS
(Elective-I)

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: Understand the behavior of expansive soil with moisture content, various foundation techniques and improvement of soil for construction of foundations.

Course Outcomes: Student will be able to

S. No	Out Come	Knowledge Level
1	Understand the occurrence and effect of expansive soils	K2
2	Understand the clay mineralogy of soil	K2
3	Apply the knowledge of soil mechanics for predicting the heave of the soil	K3
4	Design the foundation of structures for various field conditions	K3

SYLLABUS

UNIT-I

Origin and Occurrence of expansive Soils: Occurrence and Distribution in India-Moisture equilibrium-Soil, Structure, environmental interaction –Distress symptoms case histories.

UNIT-II

Identification of Expansive soils: Soil Structure –Clay mineralogy; Swell potential-Field Exploration-Laboratory tests for identification.

UNIT-III

Prediction of heave – Osmotic and matric suction: Methods of prediction of heave –Empirical Methods-double and oedometer tests –soil moisture suction-field observations-shrinkage.

UNIT-IV

Remedial Foundation techniques: Design considerations-individual and continuous footings – Stiffened mats, under reamed piles, codal provisions

UNIT-V

Chemical Stabilization and special Foundation: Mechanical alteration-sand cushion technique-CNS concept-Chemical stabilization with lime,flyash and cement-Special foundations-Under reamed piles – Straight Shafted drilled piers-Belled Piers- Granular pile anchors.

Text Books:

1. Swami Saran (1998), Analysis and design of sub structures, Limit State Design, Oxford & IBH Publishing Co.Pvt.Ltd., 66, Janpath, New Delhi 110001

Reference Books:

1. F.H.Chen (1995), Foundations in Expansive soils, Elsevier Publications.
2. R.E.Peck, W.E.Hansen & T.H.Thornburn (1996), Foundation Engineering, John Wiley.
3. Varghese.P.C. (2005), Foundation Engineering, Prentice-Hall India Pvt Ltd

TRAFFIC ENGINEERING
(Elective-I)

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: The aim of this course is to acquire sound knowledge on Traffic Characteristics, Highway Capacity, Level of Service, Parking Studies, Traffic Accident Studies, Intersection Design, Traffic Regulations and Signals.

Course Outcomes: Upon successful completion of the course, the students will be able to

S. No	Out Come	Knowledge Level
1	Demonstrate the Traffic Characteristics.	K2
2	Identify Highway Capacity and Level of Service	K3
3	Distinguish Parking Studies and Traffic Accident Studies	K4
4	Develop Intersection Design.	K3
5	Classify Traffic Regulations and Signals.	K4

SYLLABUS

UNIT-I

Traffic Characteristics

Basic traffic characteristics - Speed, volume and concentration, Relationship between Flow, Speed and Concentration Volume Studies- Objectives, Methods, Speed studies - Definition of Spot Speed, time mean speed and space mean speed, Methods of conducting speed studies; Presentation of speed study data

UNIT-II

Highway Capacity and Level of Service

Head ways and Gaps; Critical Gap; Gap acceptance studies. Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, multilane highways and freeways.

UNIT-III

Parking Studies and Traffic Accident Studies

Parking Studies and Traffic Safety, Types of parking facilities - on street parking and off-street Parking facilities, Parking studies and analysis, Accident studies and analysis; Causes of accidents- The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents

UNIT-IV

Intersection Design

Type of Intersection, Conflicts at Intersection —At grade intersection — Uncontrolled, Channelization, signalized intersection - Design of Isolated Traffic Signal by Webster method, Types of Grade Separated Intersection and Design of Rotary

UNIT-V

Traffic Regulation and Signals

Traffic Regulation and Environment: - Traffic Signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram Warrants for signalization, Signal Coordination methods. Detrimental effects of Traffic on Environment; Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic

Text Books:

1. Traffic Engineering and Transportation Planning, L. R. Kadiyali, 4th Edition, Khanna Publishers, 1991.
2. Highway Engineering, S. K. Khanna & C.E.G Justo, 9th Edition, Nem Chand & Bros Publisher, 2012.
3. Intelligent Transport Systems Standards, Bob Williams, 2008, Artech House Publishers

Reference Books:

1. Traffic Engineering-Theory & Practice, Louis J. Pignataro, 2nd Edition, Prentice Hall Publication, 1973.
2. Transportation Engineering-An introduction, C. Jotin Khistry, 3rd Edition, Prentice Hall Publication, 2002.
3. Traffic Flow Fundamentals, A.D., Prentice Hall Inc., 1990, New Jersey

PRESTRESSED CONCRETE STRUCTURES
(Elective-II)

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: Students shall be able to:

1. Understand the basic concepts of prestressing, materials
2. Understand the various prestressing systems, losses, IS code provisions.
3. Understand the analysis of prestressed members, assumptions, pressure or thrust line, concept of load balancing, stress in tendons as per IS code provisions.
4. Design the flexural members and design for shear as per IS code provisions.
5. Understand the transfer of prestress in pretensioned members, transmission length, bond stress, end zone reinforcement, flexural bond stress as per IS code provisions

Course Outcomes: Students should be able to:

S. No	Out Come	Knowledge Level
1	Calculate the prestressing losses as per IS code provisions.	K3
2	Analysis of prestress members and stress in tendons as per IS:1343	K4
3	Designing the Prestressed members for flexural and shear, as per IS code provisions.	K3
4	Analysis of transfer of prestress (pretensioned members) as per code provisions	K4

SYLLABUS

UNIT-I

Introduction, basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete. Materials for prestressed concrete-high strength concrete and high strength steel.

UNIT-II

Prestressing systems: Introduction, Tensioning devices Pretensioning systems and Post tensioning systems. **Prestressing losses:** Nature of losses of prestress, Loss due to Elastic shortening of concrete, loss due to shrinkage of concrete, loss due to creep of concrete, loss due to relaxation of stress in steel, loss due to friction, loss due to anchorage slip Total losses allowed for in design.

UNIT-III

Analysis of prestress and bending stresses: Basic assumptions, Analysis of prestress members, resultant stresses at a section, pressure line or thrust line, internal resisting couple, concept of load balancing, stress in tendons cable profile, cracking moment.

UNIT-IV

Flexural and shear strength of prestressed concrete section: Types of flexural failure, strain compatibility method, Simplified IS code procedures, shear and principal stresses, ultimate shear resistance of prestressed concrete section, design of shear reinforcement by Indian code recommendations

UNIT-V

Transfer of prestress in Pretensioned members: Transmission of prestressing force by bond, transmission length, bond stresses, Transverse tensile stress, End Zone reinforcement, flexural bond stresses, IS Code Provisions for bond and transmission length.

Text Book:

1. 'Prestressed Concrete' Krishna Raju.N, Tata McGraw- Hill Publishing company Limited, New Delhi.

Reference Books:

1. Prestressed Concrete by N.Rajagopalan.
2. Prestressed Concrete by P. Dayaratnam.
3. Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns.

GROUND IMPROVEMENT TECHNIQUES
(Elective-II)

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: Students learn

1. Various techniques of in-situ ground modification.
2. Concepts, purpose and effects of grouting.
3. Knowledge of reinforcement to soils in the form of geo textiles and geogrids.
4. Basic knowledge on various ground improvement techniques and their suitability for various types of soil conditions.

Course Outcomes:

S. No	Out Come	Knowledge Level
1	Apply in-situ densification methods for improving cohesive and cohesion less soil deposits	K3
2	Apply grouting technique for improving soils	K3
3	Understand the purpose of geotextile and geogrid	K2
4	Apply the concepts of reinforced soil to various structures	K3
5	Understand various soil stabilization techniques	K2

SYLLABUS

UNIT-I

In-situ densification Methods: Granular soils – Introduction of vibration at the ground surface, Impact at the ground surface, vibration at depth, impact at depth, field compaction control; Cohesive soils - introduction, preloading or dewatering, drain walls, sand drains, sand wicks, geodrains/band drains, lime columns, Stone columns: construction practice, comparison with lime column, design principles, vibrofloatation techniques and other techniques like dynamic replacement etc., forced vacuum preconsolidation, thermal methods

UNIT-II

Grouting: Introduction, grout injections, suspension and solution grouts, grouting equipment and methods, applications.

UNIT-III

Geosynthetics: Geotextiles: Introduction, types of geotextiles; Functions and their application, tests for geotextile, Geogrids: Introduction, types, functions and applications, tests for geogrids.

UNIT-IV

Reinforced Soil: Principles, components of reinforced soil, functions, determination of angle of interfacial friction, factors effecting angle of interfacial friction, application of reinforced soil technique

UNIT-V

Stabilization: Mechanical stabilization, Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization: types of admixtures, mechanism, factors affecting, construction methods.

Text Books:

1. Construction and Geotechnical Methods in Foundation Engineering, Robert M. Koerner: McGraw Hill.
2. Purushothama Raj. P, “Ground Improvement Techniques”, 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 1998.
3. Engineering with Geosynthetics by G.VenkatappaRao and G.V.S. SuryanarayanaRaju – Tata McGraw Hill, New Delhi, 1990.

References:

1. Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla, Jian-Hua Yin, CRC Press.
2. NPTEL: <https://nptel.ac.in/courses/105108075/>

TRANSPORTATION PLANNING
(Elective-II)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives:

The Aim of this course is to acquire sound knowledge on urban structure & Transport Systems, Comprehensive Transport Planning study, Economic Evaluation of Transport Projects, Environmental standards and Transport Policy and Management

Course Outcomes: Upon successful completion of the course, the students will be able to

S. No	Out Come	Knowledge Level
1	Explain about Urban Structure and Transport Systems.	K2
2	Apply Comprehensive Transport Planning Study.	K3
3	Analyze Economic Evaluation of Transport Projects.	K4
4	Apply Transport and Environmental standards	K3
5	Apply Transport Policy and Management.	K3

SYLLABUS

UNIT-I

Urban Structure and Transport System Types of Urban Form and Structure, Impact of urban form and structure on transport system development, urban structure and mobility levels, concept of accessibility, land use - Transport Cycle, Transit Oriented Development (TOD), Case Studies.

UNIT-II

Comprehensive Transport Planning Study area definitions, surveys and studies, survey techniques; and transport planning process – trip generation, trip distribution, modal split, trip assignment; land use transport models, Scenario development, Comprehensive Mobility Plan (CMP) Components, Case studies

UNIT-III

Economic Evaluation Economic appraisal of transport projects, techniques for estimating direct and indirect road user costs and benefits, value of travel time.

UNIT-IV

Transport and Environment Traffic noise - factors affecting noise, noise abatement measures, standards; air pollution – factors affecting air pollution levels, abatement measures, standards; Traffic Safety- accident reporting and recording systems, factors affecting road safety; Transport Planning for Target groups - Children, adults, handicapped and women; Norms and Guidelines for highway landscape; Street lighting type - standards and design considerations

UNIT-V

Transport Policy and Management Review of national, state and local level transport policies and their relevance in spatial and economic planning; pricing and funding of transport systems; energy and environment implications in transport; existing organizational and legal framework, transport co-ordination; Transport System Management (TSM) Plans

Text Books: Text Books:

1. Traffic Engineering and Transport Planning by L.R. Kadiyali - Khanna Publishers.
2. Transportation Engineering by J. Khisty and Lal - Prentice Hall.

Reference Books:

1. Transport Planning by M. Bruton - Prentice Hall

URBAN HYDROLOGY
(Elective-II)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives:

1. Appreciate the impact of urbanization on catchment hydrology.
2. Understand the importance of short duration rainfall runoff data for urban hydrology studies.
3. Learn the techniques for peak flow estimation for storm water drainage system design.
4. Understand the concepts in design of various components of urban drainage systems.
5. Learn some of the best management practices in urban drainage.
6. Understand the concepts of preparation master urban drainage system

Course Outcomes: Upon successful completion of the course, the students will be able to

S. No	Out Come	Knowledge Level
1	Develop intensity duration frequency curves for urban drainage systems	K3
2	Develop design storms to size the various components of drainage systems	K3
3	Apply best management practices to manage urban flooding	K3
4	Prepare master drainage plan for an urbanized area	K3

SYLLABUS

UNIT-I

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology

UNIT-II

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems

UNIT-III

Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse, major and minor systems.

Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control

UNIT-IV

Analysis and Management: Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for stormwater management

UNIT-V

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes , planning objectives, comprehensive planning , use of models in planning

Text Books:

1. Manual on Drainage in Urbanised area‘by Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 – 2 volumes), UNESCO.
2. Urban Hydrology‘by Hall M J (1984), Elsevier Applied Science Publisher

Reference Books:

1. Hydrology – Quantity and Quality Analysis‘ by Wanielista M P and Eaglin (1997), Wiley and Sons.
2. Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling‘ by Akan A.O and R.L. Houghtalen (2006), Wiley International

Code: B17 CE 4112

HIGHWAY MATERIALS TESTING LAB

Lab : 3 Periods

Exam : 3 Hrs.

Int.Marks : 50

Ext. Marks : 50

Credits : 2

Course Objectives: The aim of this course is to acquire sound knowledge on how to evaluate the Quality of Road Aggregates and Bitumen

Course Outcomes: At the end of the course, the student will be able to:

S. No	Out Come	Knowledge Level
1	Evaluate the quality of Road Aggregates	K5
2	Evaluate the quality of Bitumen	K5

SYLLABUS

Testing of Aggregates : Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Angularity Number – Aggregate Crushing value – Impact value – Abrasion value – Stripping value & Soundness.

Testing of bitumenous material : Specific gravity – Penetration value – Viscosity value – Softening point – Ductility value – Flash and Fire point.

Testing on Soils : C.B.R. test (IS 2720 – Part-XVI) – N.D.C. Penetration test (IS 2720 Part-XXXII) – Group Index.

Testing on Bituminous Mixes: Bitumen Extraction Test, Marshal Stability Test (Demonstration)

Reference Books:

1. Lab manual in High way Engineering by Ajay.K.Duggal & Vijay .P.Puri, New Age publications, New Delhi

COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

Lab : 3 Periods

Exam : 3 Hrs.

Int.Marks : 50

Ext. Marks : 50

Credits : 2

Course Objectives: Students learn

1. To understand the purpose of computer applications in civil engineering.
2. To analyze and design the structures using various software.

Course Outcomes: Students will be able to

S. No	Out Come	Knowledge Level
1	Develop a program which are necessary to classify and evaluate the values	K3
2	Develop an excel sheet for the design of structural elements	K3
3	Model and analyze the beams and plane frames using STAAD	K4

SYLLABUS

Introduction

Introduction - Various software that are used in Civil Engineering based on their purpose - Drafting - AutoCAD - Coding - C Language- Excel - Analysis and design- FEM based software (Like STAAD,SAP,ETABS)

Development and Execution of Programs in C-language

1. Create a program to determine the bending moment and shear force for uniformly distributed load on various beams.
2. Create a program to classify a soil sample based on the given data.
3. Create a program to determine the Darcy's friction factor for a circular pipe.
4. Create a program to estimate the population for the year by arithmetic increase method and geometric increase method.
5. Create a program to convert a whole circle bearing to reduced bearing.

Formulation of design sheets in Excel.

1. Create a excel sheet to design a one way slab for the given uniform distributed loads.
2. Create a excel sheet to design a singly reinforced beam.
3. Hardy cross method for pipe network

Analysis and Design of RCC elements.

1. Analysis and design of a plane frame.
2. Analysis and design of beam with various supports.

Reference Books:

1. Balaguruswamy. E "Object –Oriented Programming in C", Tata McGraw Hill.
2. Excel: Quick start guide from beginner to expert.

SCHEME OF INSTRUCTION & EXAMINATION
 (Regulation R17)
IV/IV B.TECH
 (With effect from **2017-2018** Admitted Batch onwards)
CIVIL ENGINEERING
 (Accredited by NBA)
II-SEMESTER

Code No.	Name of the Subject	Credits	Lect. Hrs	Tut. Hrs	Lab Hrs	Contact Hrs/ Week	Int. Marks	Ext. Marks	Tot. Marks
B17 CE 4201	Water Resources Engineering-II	3	3	1	--	4	30	70	100
#ELE-III	Elective-III	3	3	1	--	4	30	70	100
B17 CE 4206	Irrigation Structures Design & Drawing	2	1	--	2	4	50	50	100
B17 CE 4207	Seminar	2	--	--	--	--	50	--	50
B17 CE 4208	Project work	10	--	--	3	3	60	140	200
Total		20	7	2	5	14	220	330	550

#ELE-III	B17 CE 4202	Advanced Structural Analysis
	B17 CE 4203	Environmental Impact Assessment
	B17 CE 4204	Earth Retaining Structures
	B17 CE 4205	Pavement Analysis and Design

WATER RESOURCE ENGINEERING-II

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: Student may know the

Gravity and earth dams, Spillways and energy dissipation works, Irrigation canals, diversion head works, river training works and the principal components of hydroelectric scheme

Course Outcomes: Student will be able to

S. No	Out Come	Knowledge Level
1	Analyze gravity and earth dams	K4
2	Design of Irrigation canals	K4
3	Design Spillways and energy dissipation works	K4
4	Design diversion head works	K4
5	Classify river training works	K2
6	Use the principal components of hydroelectric scheme	K2

SYLLABUS**UNIT-I**

Canal Systems: Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedy’s and Lacey’s theories, , Design problems –Water logging – Causes and control – Land drainage; Canal lining – methods, Design of lined canals.

UNIT-II

Storage Works: Classification of dams, Factors governing selection of types of dam, Selection of site.

Gravity Dams : Forces acting on a gravity dam, Modes of failure – Elementary and Practical profiles, Principal and shear stress – Galleries, Foundation treatment of gravity dam.

Earth Dams: Types, Foundation for earth dams, Causes for failure of earth dams– Seepage control through body and foundation.

Spillways: Essential requirements, Components, Types of spillways and their working, Design of ogee spillway, Energy dissipation below spill way, Use of hydraulic jump as energy dissipater – USBR and IS standard basins.

UNIT-III

Diversion Head Works: Types, Location and components, Blighs, Lanes and Khoslas theories, Method of independent variables, Design of vertical drop weir, Silt control devices.

Regulation Works: Canal falls – Definition, Classification of falls, Design principles of syphon well drop, Notch fall; Cross regulator and Distributary head regulator – Design of cross regulator and Distributor head regulator.

Cross Drainage Works: Types, Classification of aqueducts, Design principles of different types of aqueducts.

UNIT-IV

River Training Works: River Training and its objectives, Classification of river training works, Marginal embankment, Guide banks, Groynes, cutoffs, Bank pitching, Launching aprons, Miscellaneous types of river training works.

UNIT-V

Water Power engineering: Development of hydro power in India, Assessment of available power, Utilization factor, Load factor, Diversity factor, Storage and Pondage; Types of hydropower schemes; Components of hydel schemes – Fore bay, Intake structure, Trash racks, Surge tanks; Water hammer pressure, Substructure and Superstructure of power house.

Text Books:

1. Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.

Reference Books:

1. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.
2. Impacts of climate change and climate variability on hydrological regimes, Jan C. van Dam, Cambridge University Press.
3. Hydrology: Principles, Analysis and Design, Raghunath, H.M., New Age International.

ADVANCED STRUCTURAL ANALYSIS
(Elective-III)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives: The student able to understand the concept of

1. Analysis of fixed beams and portal frame using by column-analogy method.
2. Analysis of portal frame by matrix methods.
3. Analysis of multi-storey frames by approximate methods.

Course Outcomes: The student should confident to

S. No	Out Come	Knowledge Level
1	Determine the fixed end moments of fixed beams with different moment of inertia and member end moments of symmetrical and un symmetrical portal frame by column-analogy method.	K4
2	Determine the member end moments of single bay single storey portal frames by flexibility and stiffness matrix methods	K4
3	Determine the moments of multi-storey frames subjected to vertical loads by substitute frame method and multi-storey frames subjected to lateral loads by portal, cantilever and girder factor method.	K4

SYLLABUS

UNIT-I

Column-analogy method: Fixed-end moment for beams element with constant and variable moment of inertia by column-analogy method. Moments in quadrangular frames with one axis of symmetry and moments in unsymmetrical quadrangular frames by column-analogy method.

UNIT-II

Introduction to Matrix methods: Analysis of single bay single storey portal frames by Flexibility matrix method. Analysis of single bay single storey portal frames by stiffness matrix method.

UNIT-III

Analysis for design moments in continuous systems: Assumptions for vertical-load analysis. Gravity load patterns for maximum moments- design moments in beams-design moments in columns. Simplified method- analysis of multistorey-frames by substitute frame method, subjected to gravity loads.

UNIT-IV

Analysis of Multistorey-frames by approximate methods for lateral loads: lateral-load analysis of multistory frames. Degree of indeterminacy vs number of assumptions. Assumptions for lateral-load analysis..

UNIT-V

Analysis of multistory frames with wind loads by Portal Method, Cantilever Method and Girder Factor Methods

Text Books:

1. Intermediate structural Analysis by C.K Wang, McGraw Hill International Edition
2. Matrix Analysis of framed Structures- Weaver& Gere

Reference Books:

1. Structural Analysis - A Matrix Approach by G S Pandit & S. P.Gupta, McGraw Hill International Edition
2. Structural analysis – Devdas Menon, Narosa Publishing House PVT.LTD

**ENVIRONMENTAL IMPACT ASSESSMENT
(Elective-III)**

Lecture	: 3 Periods	Int.Marks	: 30
Tutorial	: 1 Period.	Ext. Marks	: 70
Exam	: 3 Hrs.	Credits	: 3

Course Objectives: Student shall be able to:

1. Learn the guidelines to prepare EIA and EIS report
2. Acquire knowledge in the methodologies and various attributes
3. Analyze the impact of urbanization and industrialization on the environment.

Course Outcomes: By the end of the course, the student should be able to:

S. No	Out Come	Knowledge Level
1	Explain the elements of EIA and EIS	K2
2	Explain the environmental attributes to be considered for the EIA study	K2
3	Explain the methodologies for EIA and review the relief and rehabilitation works	K2
4	Explain the prediction and assessment of impacts	K2
5	Explain the case studies of EIA	K2

SYLLABUS

UNIT – I

EIA and EIS concepts – Elements of EIA – Guidelines for the preparation of EIS – Governmental policies for environmental protection

UNIT - II

Environmental attributes – air, water, soil, noise, ecological, social, economical, cultural, human and aesthetic aspects – Environmental indices

UNIT - III

Methodology for the identification of impacts – Criteria for the selection of methods – Description of methodologies- Adhoc, Checklist, Overlaying, Matrix and Network methods

UNIT – IV

Prediction and Assessment of Impacts on – air, water, soil, noise, ecological, social, economical, cultural, human environments and aesthetic aspects

UNIT – V

Review of Environmental Impact Statement – Cost benefit analysis – Measures for environmental impact mitigation and control - Case studies

Text Books:

1. Environmental Impact analysis – Urban and Jain

Reference books

1. Environmental Impact Analysis – Canter
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu and Valli Manikkam. BSP Books PVT Ltd.
3. Environmental Impact assessment by Anji Reddy. BSP Books PVT Ltd.

EARTH RETAINING STRUCTURES
(Elective–III)

Lecture : 3 Periods
Tutorial : 1 Period
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives:

1. To impart the knowledge on different types of earth pressure theories and know to design different types of Retaining walls.
2. To impart the knowledge on different types of sheet pile structures and Reinforced earth structures.

Course Outcomes: Students will be able to

S. No	Out Come	Knowledge Level
1	Apply the knowledge of lateral earth pressure theories for retaining structures	K3
2	Design the different types of Retaining walls and sheet piles using earth pressure theories.	K3
3	Design the Reinforced soil retaining walls, Braced cuts and cofferdams.	K3

SYLLABUS

UNIT-I

Earth pressures – Different types and their coefficients- Classical Theories of Earth pressure – Rankine’s and Coulomb’s Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb’s Theory in active and passive conditions.

UNIT-II

Retaining walls – different types - Type of Failures of Retaining Walls– Stability requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT-III

Sheet Pile Structures – Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and Fixed earth support methods – Row’s moment reduction method – Location of anchors, Forces in anchors.

UNIT-IV

Soil reinforcement – Reinforced Soil - Different components – their functions – Mechanics of reinforced soil – Failure modes-Failure theories – Design of Reinforced Soil Retaining Walls

UNIT-V

Braced cuts and Cofferdams: Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability,

merits and demerits – Design of single – wall cofferdams and their stability aspects– TVA method and Cummins' methods.

Text Books:

1. Principles of Foundation Engineering by Braja M. Das.
2. Foundation analysis and design – Bowles, JE – McGraw Hill.

Reference Books:

1. Soil Mechanics in Engineering Practice – Terzaghi, K and Rolph, B. peck 2ndEdn. – John Wiley & Co.
2. Analysis and Design of Foundations and Retaining Structures, Prakash, S – SarithaPrakashan, Mearut.

PAVEMENT ANALYSIS AND DESIGN
(Elective–III)

Lecture : 3 Periods
Tutorial : 1 Period
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

Course Objective: Engineering analysis of stresses and strains in typical highway pavement structures due to loading from traffic and climate; characterization of paving materials; structural pavement design.

Course Outcomes: At the end of the course, the student will be able to

S. No	Out Come	Knowledge Level
1	Classify the factors affecting Pavement Design.	K2
2	Analyze stresses and strains in a flexible pavements	K4
3	Analyze stresses and strains in Rigid Pavements	K4
4	Design a Flexible pavement using IRC and AASHTO,	K5
5	Design a Rigid Pavement using IRC and AASHTO.	K5

SYLLABUS

UNIT – I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses In flexible Pavement: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible pavements; Stress In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts;.

UNIT – III

Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stress Inducing Factors in Rigid Pavements, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, and Stresses in Dowel Bars & Tie Bars.

UNIT – IV

Design of Flexible Pavements: Factors effecting Design. Deflection studies in Flexible Pavements. Present Serviceability Index. IRC guidelines for Flexible Pavements. Pavement Performance and methods- AASHTO and Asphalt Institute Method. Need for Overlays, Overlays design methods for Flexible and Rigid pavements.

UNIT – V

Design Of Rigid Pavements Factors effecting Design – Wheel load & its repetition, subgrade strength & proportion, strength of concrete- modulus of elasticity. Reinforcement in slab. Design of joints. Design of Dowel bars. Design of Tie bars. IRC and AASHTO methods of Rigid Pavement design.

Text Books:

1. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
2. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
5. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers

References:

1. IRC: 37 Codes for Flexible Pavements Design.
2. IRC: 58 Code for Rigid Pavement Design

IRRIGATION STRUCTURES DESIGN & DRAWING**Lab : 3 Periods****Exam : 3 Hrs.****Lecture: 1Period****Int.Marks : 50****Ext. Marks : 50****Credits : 2**

Course Objectives: Student may know the
The paper - space environment thoroughly, components using 2D & 3D wire frame models through various editing commands, assemble of various components of compound solids and irrigation canal structures (K6)

Course Outcomes: Student will be able to

S. No	Out Come	Knowledge Level
1	Understand the paper - space environment thoroughly	K2
2	Develop the components using 2D & 3D wire frame models through various editing commands	K3
3	Explain assemble of various components of compound solids	K3
4	Design irrigation canal structures	K5

LIST OF DRAWINGS**Design and drawing of the following Irrigation Structures**

1. Tank Surplus weir
2. Barrage
3. Glacis type of canal drop
4. Notch fall
5. Siphon Aqueduct- type III
6. Cross regulator and head regulator

Reference Books:

1. Water Resources Engineering, by C.SatyanarayanaMurthy
2. Water Resources Engineering, by SK Garg
3. Design of Irrigation Structures by RSN Murthy

Note: *ISDD External marks are allotted based on External viva-voce only

SEMINAR

Lecture	: --	Int.Marks	: 50
Tutorial	: --	Ext. Marks	: --
Exam	: --	Credits	: 2

For the seminar, each student has to be evaluated based on the presentation of any latest topic with report of 10-15 pages and a PPT of minimum 10 slides. The student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member.

NOTE: Minimum of 50 % of marks is required to pass in seminar. If a student fails to get those minimum marks he/she has to again present the same topic within 2 weeks from the date of earlier presentation.

PROJECT WORK

Lab	: 3 Hrs.	Int.Marks	: 60
Tutorial	: --	Ext. Marks	: 140
Exam	: --	Credits	: 10

Course Outcomes: At the end of the Project Work students will be able to

S.No	Out Come	Knowledge Level
1	Identify a current problem through literature/field/case studies	K3
2	Identify the background objectives and methodology for solving the same.	K3
3	Design a technology/ process for solving the problem.	K6
4	Develop a technology/ process for solving the problem.	K6
5	Evaluate that technology/ process at the laboratory level.	K5

Format for Preparation of Project Thesis for B. Tech:

1. Arrangement Of Contents: The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page .
2. Bonafide Certificate
3. Abstract.
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

*The table and figures shall be introduced in the appropriate places.

Note:

Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the end semester examination. The end semester examination (VivaVoce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.