SCHEME AND SYLLABUS

B .TECH (CIVIL ENGG.)

CREDIT BASED SYSTEM
(2016 Batch onwards)

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

Revised Scheme B.Tech. (Civil Engineering) wef 2016 Batch 2nd year

SEMESTER-3						
	Course Code	**Course Name**	**L**	**T**	**P/D**	**Credits**
ES-6	EVS-201-L	Environmental Studies	3	-	-	3
PC-I	CVE-201-L	Structural Analysis-I	3	2	-	4.0
PC-2	CVE-203-L	Fluid Mechanics-I	3	1	-	3.5
PC-3	CVE-205-L	Surveying-I	3	1	-	3.5
PC-4	CVE-207-L	Engineering Geology	3	1	-	3.5
PC-5	CVE-209-L	Building Construction, Materials & Drawing	3	-	2	4.0
	CVE-201-P	Structural Analysis-I Lab	-	-	2	1
	CVE-203-P	Fluid Mechanics-I Lab	-	-	2	1
	CVE-205-P	Surveying-I Lab	-	-	3	1.5
MC-3 (Non Credit)	CVE-211-P	Skills & Innovation Lab (2 Unit)	-	-	3	-
	Total					**25**
SEMESTER-4						
	Course Code	**Course Name**	**L**	**T**	**P/D**	**Credits**
HS-4	HUM-201-L	Fundamentals of Management	3	-	-	3
BS-6	MAT- 201-L	Mathematics-III	3	1	-	3.5
PC-6	CVE –202-L	Structural Analysis-II	3	2	-	4.0
PC-7	CVE – 204-L	Fluid Mechanics-II	3	2	-	4.0
PC-8	CVE – 206-L	Soil Mechanics	3	1	-	3.5
PC-9	CVE –208-L	Surveying-II	3	1	-	3.5
	CVE –204-P	Fluid Mechanics-II Lab	-	-	2	1
	CVE –206-P	Soil Mechanics Lab	-	-	2	1
	CVE –208-P	Surveying-II Lab	-	-	3	1.5
MC-4 (Non Credit)	PSY-201-L	Personality Development (2 Unit)	2	1	-	-
	Total					**25**

Note: The students shall devote 3 - 4 weeks to Survey Camp after 4th Semester Examination. The evaluation of survey camp will be taken up in the 5th semester.

Revised Scheme B.Tech. (Civil Engineering) wef 2016 Batch 3rd year

SEMESTER-5						
	Course Code	**Course Name**	**L**	**T**	**P/D**	**Credits**
PC-10	CVE-301-L	Structural Analysis-III	3	1	-	3.5
PC-11	CVE-303-L	Design of Steel Structures-I	3	-	2	4.0
PC-12	CVE-305-L	Design of Concrete Structures-I	3	1	-	3.5
PC-13	CVE-307-L	Hydrology	3	-	-	3.0
PC-14	CVE-309-L	Geotechnology-I	3	-	-	3.0
PC-15		**Open Elective-I(List attached)**	4	-	-	4.0
	CVE-301-P	Structural Mechanics-II(P)	-	-	2	1.0
	CVE-305-P	Concrete Lab (P)	-	-	2	1.0
	CVE-309-P	Geotechnology (P)	-	-	2	1.0
	CVE-313-P	Survey Camp	-	-	-	1.0
	Total					**25**
SEMESTER-6						
	Course Code	**Course Name**	**L**	**T**	**P/D**	**Credits**
PC-16	CVE-302-L	Design of Steel Structures-II	3	-	2	4.0
PC-17	CVE-304-L	Irrigation Engineering-I	3	1	-	3.5
PC-18		**Open Elective-II(List attached)**	4	-	-	4.0
PC-19	CVE-308-L	Geotechnology-II	3	1	-	3.5
PC-20	CVE-310-L	Transportation Engineering-I	3	1	-	3.5
PC-21	CVE-312-L	Water Supply & Treatment	3	1	-	3.5
	CVE-310-P	Transportation Engg.I(P)	-	-	2	1.0
	CVE-312-P	Environmental Engg.-I(P)	-	-	2	1.0
	CVE-314-P	Computer Applications	-	-	2	1.0
	Total					**25**

Note: Students shall devote 4-6 weeks to training after 6th semester examination outside the College campus at approved works.

Open Elective-I, II :- Students are required to study one elective subject from any other Department, each in 5th and 6th Semester

Revised Scheme B.Tech. (Civil Engineering) wef 2016 Batch 4th year

SEMESTER-7						
	Course Code	**Course Name**	**L**	**T**	**P/D**	**Credits**
PC-22	CVE-401-L	Design of Concrete Structures-II	3	1	-	3.5
PC-23	CVE-403-L	Irrigation Engineering-II	3	1	-	3.5
PC-24	CVE-405-L	Transportation Engg.-II	3	1	-	3.5
PC-25	CVE-407-L	Sewerage & Sewage Treatment	2	1	-	2.5
PC-26		**Open Elective-III(List attached)**	4	-	-	4.0
PC-27	CVE **(List attached)**	**Departmental Elective-I**	3	1	-	3.5
	CVE-409-D	Concrete Structures-II (Drawing)	-	-	2	1.0
	CVE-411-D	Irrigation Engg. Design & Drawing	-	-	2	1.0
Project – I (any one)	CVE-429-P	Geotechnical Engineering OR	-	-	3	1.5
	CVE-431-P	Transportation Engineering OR				
	CVE-433-P	Environmental Engineering				
	CVE-435-P	Practical Training Report	-	-	2	1.0
	Total					**25**
Open Elective-III :- Students are required to study one elective subject from any other Department, in 7th Semester						
SEMESTER-8						
	Course Code	**Course Name**	**L**	**T**	**P/D**	**Credits**
PC-28	CVE-402-L	Bridge Engineering	3	1	-	3.5
PC-29	CVE-404-L	Railway & Airport Engineering	3	-	-	3.0
PC-30	CVE-406-L	Industrial Waste Water Treatment	3	1	-	3.5
PC-31	**CVE (List attached)**	**Departmental Elective-II**	3	1	-	3.5
PC-32	CVE **(List attached)**	**Departmental Elective-III**	3	1	-	3.5
	CVE-408-P	Estimation & Accounts	-	-	2	1.0
	CVE-426-P	Transportation Engg.-II(P)	-	-	2	1.0
	CVE-428-P	Environmental Engg.II (P)	-	-	2	1.0
Project – II (any one)	CVE-430-P	Structural Engineering OR	-	-	4	2.0
	CVE-432-P	Water Resources Engineering				
	CVE-434-P	Seminar	-	-	4	2.0
	CVE-436-P	General Fitness & Professional Aptitude	-	-	-	1.0
	Total					**25**
Note: -Note: If the student gets the job through campus placement during 7th semester and the employer is willing to take the student for training for a period of six months (8th semester), the student will be required to submit to the department, the offer letter for full semester industrial training at least 15 days before the commencement of 8th semester and if approved by the Vice-Chancellor, the student can opt for one semester industrial training in lieu of attending the course of 8th semester.						

Departmental Elective-I

Course Code	Course Name	L	T	P/D	Credits
CVE- 413-L	Hydro Electric Power Development	3	1	-	3.5
CVE- 415-L	River Mechanics & Flood Control	3	1	-	3.5
CVE- 417-L	IT & CAD Applications in Civil Engg.	3	1	-	3.5
CVE- 419-L	Rock Mechanics	3	1	-	3.5
CVE-421-L	Elements of Earthquake Engineering	3	1	-	3.5
CVE-423-L	Concrete Technology	3	1	-	3.5

Departmental Elective-II

Course Code	Course Name	L	T	P/D	Credits
CVE-410-L	Introduction to Finite Element Method	3	1	-	3.5
CVE-412-L	Structural Optimization	3	1	-	3.5
CVE-414-L	Geo-synthetics Engineering	3	1	-	3.5
CVE-416-L	Machine Foundations	3	1	-	3.5
CVE-418-L	Ground Water Hydrology	3	1	-	3.5
CVE-420-L	Design of Hydraulic Structures	3	1	-	3.5

Departmental Elective-III

Course Code	Course Name	L	T	P/D	Credits
CVE-422-L	Environmental Impact Assessment	3	1	-	3.5
CVE-424-L	Remote Sensing & GIS	3	1	-	3.5
CVE-426-L	Advanced Traffic Engineering	3	1	-	3.5
CVE-428-L	Transport Planning	3	1	-	3.5
CVE-430-L	Project Planning & Management	3	1	-	3.5
CVE-432-L	Water Resources & Systems Engineering	3	1	-	3.5

SEMESTER –III

ENVIROMENTAL STUDIES

Course Code: EVS 201-L Course Credits: 3.0 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus: it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic environment science.

Objectives:

- To enhance knowledge skills and attitude to environment.
- To understand natural environment and its relationship with human activities.

Course outcomes:

CO-1 Students will be able to enhance and analyze human impacts on the environment.
CO-2 Integrate concepts & methods from multiple discipline and apply to environmental problems.
CO-3 Design and evaluate strategic terminologies and methods for subs table management of environmental systems.
CO-4 Field studies would provide students first-hand knowledge on various local environment aspects which forms an irreplaceable tool in the entire learning process.

Unit-I

Definition, scope and importance, need for public awareness, Concept of ecosystems, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession ,Food chains, Food webs and ecological pyramids, Introduction, types, characteristics features, structure and function of the following ecosystems: Forest ecosystem, Grassland ecosystem , Desert ecosystem, Aquatic ecosystem (Ponds, Stream, lakes, rivers, oceans, estuaries), Study of simple ecosystems – ponds, river, hill slopes etc. , Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain.

Unit-II

Renewable and non-renewable resources, Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people, Water resources: Use and over utilization of surface and ground water, floods, droughts conflicts over water, dams benefits and problems, Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources, Food resources: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies, Land resources: Land as a resource, land degradation, main induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources, Equitable use of resources for suitable lifestyle. Introduction-Definition: genetic, species and ecosystem diversity, Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and option values, Biodiversity at global, national and local level, India as a mega-diversity nation, Hot-spot of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Study of common plants, insects, birds.

Unit-III

Definition of Environment Pollution, Causes, effects and control measures of: Air Pollution, Water Pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management:, effects and control measures of urban and industrial wastes, Role of and individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.

Unit-IV

From unsustainable of Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problem and concern, Environment ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act., Issues involved in enforcement of environmental legislation, Public awareness, Population growth, variation among nation, Population explosion- Family Welfare Programme, Environment and human health , Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

TEXT BOOK:

1. **Anubha Kaushik, C.P. Kaushik , "Perspectives in Environmental Studies",ISBN: 978-93-86418-63.**
2. **Miller TG, "Environmental Science", Wadsworth Publishing Co, 13th edition.**

REFERENCE BOOKS:

1. **Dr Erach Bharucha , "Environmental Studies for Undergraduate Courses", University press pvt. Ltd. (India)**
2. **Anil Kumar De, "Environmental Chemistry", Wiley Eastern Limited.**

ENGINEERING GEOLOGY

Course Code: CVE 207-L Course Credits: 3.5 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Earth structure and its composition.

Objectives:

- The objective of this course is to provide sufficient knowledge of resources and reserves and their uses.
- To understand and provide the effective solutions to geotechnical field problems.
- To help to understand the geological features of the area for construction onshore and offshore.

Course outcomes:

CO-1 To understand the danger of erosion, earthquake and volcano eruption etc.
CO-2 Able to understand the interior of Earth formation and type of the rocks in its layers.
CO-3 Behaviour of soil and water retaining structures with the knowledge of Landslides and hill stability.
CO-4 Study of treatment of faults, joints, ground water and geological importance of earth structure.

Unit-I

Introduction:

Definition, object, scope and sub division of geology, geology around us. The interior of the earth. Importance of geology in Civil Engineering projects.

Physical Geology:

The external and internal geological forces causing changes, weathering and erosion of the surface of the earth. Geological work of ice, water and winds. Soil profile and its importance. Earthquakes and volcanoes.

Unit-II

Mineralogy and Petrology:

Definition and mineral and rocks. Classification of important rock forming minerals, simple description based on physical properties of minerals. Rocks of earth surface, classification of rocks. Mineral composition, Textures, structure and origin of Igneous, Sedimentary and Metamorphic rocks. Aims and principles of stratigraphy. Standard geological/stratigraphical time scale with its sub division and a short description based on engineering uses of formation of India.

Structural Geology:

Forms and structures of rocks. Bedding plane and outcrops Dip and Strike. Elementary ideas about fold, fault, joint and unconformity and recognition on outcrops. Importance of geological structures in Civil Engineering projects.

Unit-III

Applied Geology:

Hydrogeology, water table, springs and Artesian well, aquifers, ground water in engineering projects. Artificial recharge of ground water, Elementary ideas of geological investigations. Remote sensing techniques for geological and hydrological survey and investigation. Uses of geological maps and interpretation of data, geological reports.

Suitability and stability of foundation sites and abutments:

Geological condition and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges etc. Landslides and Hill-slope stability.

Unit-IV

Improvement of foundation rocks:

Precaution and treatment against faults, joints and ground water, retaining walls and other precautions.
Geology and environment of earth.

TEXT BOOK:

1. A Text Book of Geology by P.K. Mukherjee

REFERENCE BOOKS:

1 Physical and General Geology by S.K.Garg
2 Engineering and General Geology by Prabin Singh
3 Introduction of Physical Geology by A.Holmes.

STRUCTURAL ANALYSIS-I

Course Code: CVE 201-L Course Credits: 4.0 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 02 hours (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like differentiation and integration etc.

Objectives:

- The objective of this course is to study the response of structures when subjected to external agitation.
- To understand the basic mechanics involved in simple structures.
- To help students to build the foundation for different ways of structure analysis.

Course outcomes:

CO-1 Basic application of mechanics involved commonly in the structures.
CO-2 Get the desired values of the resultant action in response to the agitation on the structures.
CO-3 Various techniques to analyse the structures following the slope and deflection approach.
CO-4 Analysis of trusses or forces in each member of trusses using simplified approach.

Unit-I

Analysis of stresses and strains:

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, combined stresses in beams, shear stresses, Mohr's circle, Principle stresses and strains, torsion in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.

Theory of Columns:

Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.

Unit-II

Bending moment and shear force in determinate beams and frames:

Definitions and sign conventions, axial force, shear force and bending moment diagrams.

Three hinged arches:

Horizontal thrust, shear force and bending moment diagrams.

Unit-III

Deflections in beams:

Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method, Principle of virtual work, Maxwell's Law of Reciprocal Deflections.

Unit-IV

Analysis of statically determinate trusses:

Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections. Analysis of space trusses using tension coefficient method.

TEXT BOOK:

1 Strength of Materials Part-I, S.Timoshenko, Affiliated East-West Press, New.Delhi

REFERENCE BOOKS:

1 Mechanics of Solids, Prasad, V. S. Gakgotia Pub., New Delhi.
2 Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
3 Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., Newyork.
4 Structural Analysis, Bhavikatti S.S.,Vikas Pub.House, N.Delhi.

FLUID MECHANICS-I

Course Code: CVE 203-L Course Credits: 3.5 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like differentiation and integration etc.

Objectives:

- The objective of this course is to study the response of fluids when subjected to external forces.
- To understand the basic fluid properties and its response for different flow conditions.
- To help students to study the behaviour and response of fluids using different approach.

Course outcomes:

CO-1 Basic properties of fluids and its application.
CO-2 Various conditions in respect to the flow of fluids and the concept of floating bodies.
CO-3 Flow measuring techniques and equipments with theories of fluid flow.
C0-4 Formation of hydraulic models and modules and dimension analysis of fluids.

Unit-I

Introduction:

Fluid properties, mass density, specific weight, specific volume and specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-newtonian fluids, real and ideal fluids.

Kinematics of Fluid Flow:

Stready & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flownets.

Unit-II

Fluid Statics:

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

Unit-III

Dynamic of Fluid Flow:

Euler's equation of motion along a streamline and its integration, limitation of Bernouli's equation, Pitot tubes, venturimeter, Orficemeter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.

Unit-IV

Boundary layer analysis:

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

Dimensional Analysis and Hydraulic Similude:

Dimensional analysis, Buckinghum theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

TEXT BOOK:

1 Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
2 Fluid Mechanics by Dr. R. K. Bansal.

REFERENCE BOOKS:

1 Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
2 Fluid Mechanics Through Problems by R.J.Garde
3 Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker

SURVEYING-I

Course Code: CVE 205-L Course Credits: 3.5 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like Geometry and Trigonometry etc.

Objectives:

- The objective of this course is to represent the general features of the land in their proper relative positions using field measurement.
- To understand the plotting and tracing of the topographical map of the field along with features on the sheet, to the required scale.
- To learn to prepare the map or plans to ease the planning and design of engineering products.

Course outcomes:

CO-1 Use of basic instruments for measurement of distances and angles with corrective measures.

CO-2 Able to understand the procedure of determining the height of a particular point from mean sea level and to plot the ground features on the sheet.

CO-3 Learn the use of digital and accurate instruments to determine the angles and to locate various points on the line.

CO-4 Learn the need of locating curves on the highways etc. in the plane areas and at the hills.

Unit-I

Fundamental Principles of Surveying:

Definition, objects, classification, fundamental principles, methods of fixing stations.

Measurement of distances:

Direct measurement, instruments for measuring distance, instruments for making stations, chaining of line, errors in chaining, tape corrections examples.

Compass and Chain Traversing:

Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines, local attraction, examples.

Unit-II

Leveling:

Definition of terms used in leveling, types of levels and staff, temporary adjustment of levels, principles of leveling, reduction of levels, booking of staff readings, examples, contouring, characteristics of contours lines, locating contours, interpolation of contours.

Plane Table Surveying:

Plane table, methods of plane table surveying, radiation, intersection, traversing and resection, two point and three point problems.

Unit-III

Theodolite and Theodolite Traversing:

Theodolites, temporary adjustment of theodolite, measurement of angles, repetition and reiteration method, traverse surveying with theodolite, checks in traversing, adjustment of closed traverse, examples.

Tacheometry:
Uses of tacheometry, principle of tacheometric surveying, instruments used in tacheometry, systems of tacheometric surveying-stadia system fixed hair method, determination of tacheometric constants, tangential systems, examples.

Unit-IV
Curves:
Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves. Transition Curves-Length and types of transition curves, length of combined curve, examples.
Vertical Curves: Necessity and types of vertical curves.

TEXT BOOK:
1 Surveying Vol.I & II by B.C.Punmia
2 Surveying by C. Venkatramaiah

REFERENCE BOOKS:
1 Surveying Vol.I by T.P.Kanitkar
2 Fundamentals of Surveying by S. K. Roy
3 Surveying and levelling by R. Subramaniam

BUILDING CONSTRUCTION, MATERIALS & DRAWING

Course Code: CVE 209-L Course Credits: 4.0 Mode: Lecture(L) and Drawing(D) Type: Compulsory Contact Hours: 3 hours (L) + 02 hours (D) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic fundamental properties of the material used in the construction industry.

Objectives:

- The objective of this course is to provide sufficient knowledge about various building materials along with their advantages in construction industry.
- To explore the material available and their properties for the treatment required at the time of construction.
- To study about the material and their properties required as finishing.

Course outcomes:

CO-1 Knowledge of components of structure under construction by different material with their advantages and disadvantages.
CO-2 Learn about the different material required in the interior of a structure to make the structure safe and sound.
CO-3 Compatible with the information about the bonding agents such as cement etc.
CO-4 Information about timber, metals, plastic, paints and varnishes along with their properties.

Unit-I

A. CONSTRUCTION

Masonry Construction:

Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

Cavity and Partition Walls:

Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.

Foundation:

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

Unit-II

Damp-Proofing and Water-Proofing:

Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

Roofs and Floors:

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc.
Floor structures, ground, basement and upper floors, various types of floorings.

Doors and Windows:

Locations, sizes, types of doors and windows, fixures and fastners for doors and windows.

Acoustics, Sound Insulation and Fire Protection:
Classification, measurement and transmission of sound, sound absorber, classification of absorbers, sound insulation of buildings, wall construction and accoustical design of auditorium, fire-resisting properties of materials, fire resistant construction and fire protection requirements for buildings.

Unit-III
B.MATERIALS
Stones:
Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.
Brick and Tiles:
Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.
Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.
Limes, Cement and Mortars:
Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.
Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

Unit-IV
Timber:
Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers.
Ferrous and Non-Ferrous Metals:
Definitions, manufacturing of cast iron, manufacturing of steel from pig iron, types of steel, marketable form of steel, manufacturing of aluminium and zinc.

Paints and Varnishes:
Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes.
Plastic:
Definition, classification of plastics, composition and raw materials, manufacturing, characteristics and uses, polymerization, classification, special varieties.

C. DRAWINGS
1. **Typical drawings of:**
a) Cavity Wall
b) Bonds in brick work
c) Grillage foundation
2. **Preparation of building drawing mentioning its salient features including the following details:**
a) Ground floor plan
b) Two Sectional Elevations
c) Front and Side Elevations
d) Plan and Sectional Elevation of stair case, doors/ windows/ ventilators, floor and roof.

TEXT BOOK:
1 Building Construction, Sushil Kumar, Standard Pub., N. Delhi
2 Building Material, Rangawala

REFERENCE BOOKS:
1 Construction Engineering, Y.S. Sane
2 Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.

STRUCTURAL ANALYSIS-I Lab

Course Code: CVE 201-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- The objective of this course is to study and verify the theoretical values with the experimental values.
- To study the behavior of different types of structures under loading.
- To help students to build the foundation for different ways of structural analysis.

Course outcomes:

CO-1 Basic application of mechanics involved commonly in the structures.
CO-2 Get the desired values of the resultant action in response to the agitation on the structures.
CO-3 Various techniques to analyse the structures following the slope and deflection approach.
CO-4 Analysis of trusses or forces in each member of trusses using simplified approach.

LIST OF EXPERIMENTS:

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss- horizontal deflection & vertical deflection of various joints of a pin- jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Uniaxial tension test for steel (plain & deformed bars)
9. Uniaxial compression test on concrete & bricks specimens.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

FLUID MECHANICS-I Lab

Course Code: CVE 203-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- The objective of this course is to study the response of fluids when subjected to external forces.
- To understand the basic fluid properties and its response for different flow conditions.
- To help students to study the behaviour and response of fluids using different approach.

Course outcomes:

CO-1 Basic properties of fluids and its application.
CO-2 Various conditions in respect to the flow of fluids and the concept of floating bodies.
CO-3 Flow measuring techniques and equipments with theories of fluid flow.
CO-4 Formation of hydraulic models and modules and dimension analysis of fluids.

LIST OF EXPERIMENTS:

1 To determine meta-centric height of the ship model.
2 To verify the Bernoulli's theorem.
3 To determine coefficient of discharge for an Orifice-meter.
4 To determine coefficient of discharge of a venture-meter.
5 To determine the various hydraulic coefficients of an Orifice (C_d, Cc, Cv).
6 To determine coefficient of discharge for an Orifice under variable head.
7 To calibrate a given notch.
8 To determine coefficient of discharge for a mouth piece.
9 Drawing of a flow-net by Viscous Analogy Model and Sand Box Model.
10 To study development of boundary layer over a flat plate.
11 To study velocity distribution in a rectangular open channel.
12 Velocity measurements by current meter, float, double float (demonstration only).
13 Experiment on Vortex formation (demonstration only).

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

SURVEYING-I Lab

Course Code: CVE 205-P Course Credits: 1.5 Type: Compulsory Contact Hours: 3 hours per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- The objective of this course is to represent the general features of the land in their proper relative positions using field measurement.
- To understand the plotting and tracing of the topographical map of the field along with features on the sheet, to the required scale.
- To learn to prepare the map or plans to ease the planning and design of engineering structures.

Course outcomes:

CO-1 Use of basic instruments for measurement of distances and angles with corrective measures.
CO-2 Able to understand the procedure of determining the height of a particular point from mean sea level and to plot the ground features on the sheet.
CO-3 Learn the use of digital and accurate instruments to determine the angles and to locate various points on the line.
CO-4 Learn the need of locating curves on the highways etc. in the planes and at the hills.

LIST OF EXPERIMENTS:

1 Chain surveying: Chaining and chain traversing.
2 Compass traversing.
3 Plane tabling: methods of plane table surveying, two point problem.
4 To verify the, three point problem.
5 Leveling: Profile leveling and plotting of longitudinal section and cross sections.
6. Permanent adjustment of level.
7. Reciprocal leveling.
8. Contouring and preparation contour map.
9. Use of Tangent Clinometers.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

SKILLS AND INNOVATION LAB

Course Code: CVE-211-P Course Credits: 0.0 Mode: Practical Contact Hours: 03 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** This is a non-credit course of qualifying nature. Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Prerequisite: Basic knowledge of Civil Engineering

Objectives:

1. Understand and identify research topics related to Civil Engineering through brain storming sessions.
2. Propose a novel idea/modified technique/new interpretation after identifying the existing research work.
3. Devise specific identified issue/problem in the form of research objectives.
4. Work in a group and communicate effectively the research topic though presentation and/or brain storming.

Course outcomes:

CO-1 Understand the research analysis of issues/problems on topics related to Civil Engineering.

CO-2 Understand the techniques and tools used for research analysis.

CO-3 Understand literature related to a research topic.

CO-4 Communicate effectively the research topic though presentation and/or brainstorming.

Lab Contents

A group of students are required to carry out a study related to current development and emerging trends in the field of Civil Engineering. Each group of students will also try to improve their basic skills in their respective field. The students may use the equipment's/machines/instruments available in the labs/workshops with the due permission of Chairperson/Director on recommendation of the Course Coordinator.

The students in consultation with the course coordinator will decide the topic of the study. The study report will be submitted by group at the end of semester and will be evaluated jointly by external and internal examiners.

SEMESTER –IV

FUNDAMENTALS OF MANAGEMENT

Course Code: HUM 201-L Course Credits: 3.0 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: The students should have basic understanding of the concept of management and business organizations.

Objectives:

- To enhance knowledge skills and attitude to Management.
- To understand management and its relationship with organisation.

Course outcomes:

CO-1 To develop the basic understanding of the concept of management and functions of management.
CO-2 The students will come to know about Human Resource management and Marketing management functions of management.
CO-3 Students will come to know about the production activities of any manufacturing organisations.
CO-4 To know that how finances are arranged and disbursed for all the activities of business organisations.

Unit-I

Concept of Management: Definitions, Characteristics, Significance, Practical Implications; Management Vs. Administration; Management- Art, Science and Profession; Development of Management Thoughts; Managerial Functions.

Unit-II

Concept of Human Resource Management: Human resource planning; Recruitment, Selection, Training and Development, Compensation; Concept of Marketing Management: Objectives and functions of Marketing, Marketing Research, Advertising, Consumer Behaviour.

Unit-III

Concept of Production Management, Production Planning and Control, Material management, Inventory Control, Factory location and Production Layout.

Unit-IV

Concept of Financial Management, Capital Structure and various Sources of Finance, Working Capital, Short term and long term finances, Capital Budgeting.

TEXT BOOK:

1. Principles and Practices of Management: R. S. Gupta, B. D. Sharma, N. S. Bhalla; Kalyani Publishers.
2. Organisation and Management: R. D. Aggarwal; Tata McGraw Hill.

REFERENCE BOOKS:

1. Marketing Management: S. A. Sherlikar; Himalaya Publishing House.
2. Financial Management: I.M. Pandey; Vikas Publishing House.
3. Production Management: B. S. Goel; Himalaya Publishing House.

MATHEMATICS – III

Course Code: MAT 201-L Course Credits: 3.5 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 1 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. \ For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Basic knowledge of calculus, complex analysis and statistics.

Course outcomes:

CO-1 Problems of Fourier series and Fourier transforms used in engineering applications
CO-2 Calculation of improper/ singular integrals with the help of complex analysis
CO-3 Statistical tests for system goodness.
CO-4 Problems of LPP and their interpretation.

Unit-I

Fourier Series and Fourier Transforms: Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series. Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac delta function.

Unit-II

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity. Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions. Integration of complex functions. Cauchy Theorem, Cauchy- Integral formula.

Unit-III

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Unit-IV

Probability Distributions and Hypothesis Testing: Expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions. Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit. **Linear Programming:** Linear programming problems formulation, Solving linear programming problems using (i) Simplex method.

TEXT BOOK:

1. Advanced Engg. Mathematics : F Kreyszig.
2. Higher Engg. Mathematics : B.S. Grewal.

REFERENCE BOOKS:

1. Advance Engg. Mathematics : R.K. Jain, S.R.K. Iyenger.
2. Advanced Engg. Mathematics : Michael D. Greenberg.
3. Operation Research : H.A. Taha.
4. Probability and statistics for Engineers : Johnson. PHI.

SOIL MECHANICS

Course Code: CVE 206-L Course Credits: 3.5 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 1 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. \ For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic definitions of mass, volume, density and simple mathematics.

Objectives:

- The objective of this course is to provide sufficient theoretical and practical knowledge about the properties of soil and earth material.
- To study and understand the behavior of different types of soil materials under loading.
- To understand the need of strengthening of soil related to construction activities.

Course outcomes:

CO-1 Understand the soil composition, its formation and its classification.

CO-2 Able to understand the compaction of soil under loading and comparing the theoretical values with the experimental ones.

CO-3 Learn how to analyse the stresses in the soils in the depth and to find the settlement of soils under loading.

CO-4 Knowledge to find out the shear strength in soils and to learn different theories of earth pressure.

Unit-I

Soil Formation and Composition

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, inter particle forces, soil structure, principal clay minerals.

Basic Soil Properties

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

Classification of soils

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

Permeability of Soils

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

Unit-II

Effective Stress Concept

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions, seepage force, quick condition, critical hydraulic gradient, two dimensional flow, Laplace's equation, properties and utilities of flownet, graphical method of construction of flownets, piping, protective filter.

Compaction

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

Unit-III

Vertical Stress below Applied Loads

Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis, contact pressure.

Compressibility and Consolidation

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.

Unit-IV

Shear Strength

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

Earth Pressure

Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium, Rankine's earth pressure theory, Coulomb's earth pressure theory, Culmann's graphical construction, Rebhann's construction.

TEXT BOOK:

1. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age Intetrnational(P)Ltd.Pub.N.Delhi.
2. Soil Mechanics and foundation engineering by Dr. K. R. Arora.

REFERENCE BOOKS:

1. Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
2. Engg.Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill,N.Delhi.
3. Geotechnical Engg. by P.Purshotam Raj,Tata Mcgraw Hill.
4. Principles of Geotechnical Engineering by B.M.Das,PWS KENT, Boston.

STRUCTURAL ANALYSIS-II

Course Code: CVE 202-L Course Credits: 4.0 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 2 hours (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like differentiation and integration etc.

Objectives:

- The objective of this course is to study the response of structures when subjected to external agitation.
- To understand the basic mechanics involved in complex structures.
- To help students to apply different theories to solve different structures for desired results.

Course outcomes:

CO-1 Basic application of mechanics involved in complex structures.
CO-2 Get the desired values of the resultant action in response to the agitation on the complex structures.
CO-3 Various techniques to analyse the complex structures following different approach.
CO-4 Analysis of unsymmetrical structures and to determine the stresses in structures like cable and suspension bridges.

Unit-I

Statically Indeterminate Structures:

Introduction, Static and Kinematic Indeterminacies, Castigliano's theorems, Strain energy method, Analysis of frames with one or two redundant members using Castigliano's 2^n theorem.

Unit-II

Slope deflection and moment Distribution Methods:

Analysis of continuous beams & portal frames, Portal frames with inclined members.

Unit-III

Column Analogy Method:

Elastic centre, Properties of analogous column, Applications to beam & frames.

Analysis of Two hinged Arches:

Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.

Unit-IV

Unsymmetrical Bending

Introduction Centroidal principal axes of sections, Bending stresses in beam subjected to unsymmetrical bending, shear centre, shear centre for channel, Angles and Z sections.

Cable and suspension Bridges:
Introduction, uniformly loaded cables, Temperature stresses, three hinged stiffening Girder and two hinged stiffening Girder.

TEXT BOOK:

1 Statically Indeterminate Structures, C.K. Wang, McGraw Hill Book Co., New York.
2 Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.

REFERENCE BOOKS:

1 Indeterminate Structures, R.L. Jindal, S. Chand & Co., New Delhi.
2 Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

FLUID MECHANICS-II

Course Code: CVE 204-L Course Credits: 4.0 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 2 hours (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like differentiation and integration etc.

Objectives:

- The objective of this course is to study the response of fluids when subjected to external forces.
- To understand the origin of flow conditions and to recognize this using different measurements.
- To help students to study the behaviour and response of pumps and turbines.

Course outcomes:

CO-1 Basic flow conditions and their analysis with the help of fluid properties.
CO-2 Various forces exerted on the floating and submerged bodies in fluids and application of internal forces of fluids.
CO-3 Knowledge of different types of flow.
CO-4 Formation behaviour and response of pumps and turbines.

Unit-I

Laminar Flow:

Navier Stoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere-Stokes'law.

Flow through pipes:

Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer.

Unit-II

Drag and Lift:

Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil.

Open Channel Flow:

Type of flow in open channels, geometric parameters of channel section, uniform flow, most economical section (rectangular and trapezoidal), specific energy and critical depth, momentum in open channel, specific force, critical flow in rectangular channel, applications of specific energy and discharge diagrams to channel transition, metering flumes, hydraulic jump in rectangular channel, surges in open channels, positive and negative surges, gradually varied flow equation and its integration, surface profiles.

Unit-III

Compressible flow:

Basic relationship of thermodynamics continuity, momentum and energy equations, propagation of elastic waves due to compression of fluid, Mach number and its significance, subsonic and supersonic flows, propagation of elastic wave due to disturbance in fluid mach cone, stagnation pressure.

Unit-IV

Pumps and Turbines:

Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads,. Force executed by fluid jet on stationary and moving flat vanes, Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, cavitation and setting of turbines.

TEXT BOOK:

1 Hydraulics & Fluid Mechanics by P.N.Modi and S.M.Seth

2 Fluid Mechanics by R. K. Bansal

REFERENCE BOOKS:

1 Flow in Open Channels by S.Subraminayam

2 Introduction to Fluid Mechanics by Robert N.Fox & Alan T.Macnold

SURVEYING -II

Course Code: CVE 208-L Course Credits: 3.5 Mode: Lecture(L) and Tutorial(T) Type: Compulsory Contact Hours: 3 hours (L) + 1 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine question are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type question. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like Geometry and Trigonometry etc.

Objectives:

- The objective of this course is to use different mathematical models to find the location of the general features of the land in their proper relative positions.
- To identify the sources of error and to learn the application of different mathematical models to correct these.
- To introduce the new techniques for ease of survey like aerial photographs, GIS and GPS etc.

Course outcomes:

CO-1 Application of Trigonometry to find the location of the general features of the land in their proper relative positions.
CO-2 Able to understand the errors generated in survey process and methods to rectify these.
CO-3 Understand the theory of positions: Latitude and longitude of astronomical features.
CO-4 Learn new techniques for ease of survey like aerial photographs, GIS and GPS.

Unit-I

Trigonometrical Levelling:

Introduction, height and distances-base of the object accessible, base of object inaccessible, geodetical observation, refraction and curvature, axis signal correction, difference in elevation between two points.

Triangulation:

Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations, introduction to E.D.M. instruments.

Unit-II

Survey Adjustment and Treatment of Observations:

Types of errors, definition of weight of an observation, most probable values, law of accidental errors, law of weights, determination of probable error (different cases with examples) principle of least squares, adjustment of triangulation figures by method of least squares.

Unit-III

Astronomy:

Definitions of astronomical terms, star at elongation, star at prime vertical star at horizon, star at culmination, celestial coordinate systems, Napier's rule of circular parts, various time systems: sidereal, apparent, solar and mean solar time, equation of time-its cause.

Unit-IV

Elements of Photo-grammetry:

Introduction: types of photographs, types of aerial photographs, aerial camera and height displacements in vertical photographs, stereoscopic vision and stereoscopies, height determination from parallax measurement, flight planning,

Introduction of remote sensing and its systems:

Concept of G.I.S and G.P.S. -Basic Components, data input, storage & output.

TEXT BOOK:

1 Surveying Vol.2 by B.C.Punmia
2 Surveying Vol.3 by B.C.Punmia

REFERENCE BOOKS:

1 Surveying Vol2 by T.P.Kanitkar
2 Higher Surveying by A M Chandra

FLUID MECHANICS-II Lab

Course Code: CVE 204-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- The objective of this course is to study the response of fluids when subjected to external forces.
- To understand the basic fluid properties and its response for different flow conditions.
- To help students to study the behaviour and response of fluids in different pipe fittings.

Course outcomes:

CO-1 Basic properties of fluids and its application.
CO-2 Various conditions in respect to the flow of fluids and the concept of floating bodies.
CO-3 Properties and functioning of centrifugal pump.
CO-4 Study of flow in various pipe fittings.

LIST OF EXPERIMENTS:

1 To determine the coefficient of drag by Stoke's law for spherical bodies.
2 To study the phenomenon of cavitation in pipe flow.
3 To determine the critical Reynold's number for flow through commercial pipes.
4 To determine the coefficient of discharge for flow over a broad crested weir.
5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6 To study the scouring phenomenon around a bridge pier model.
7 To study the scouring phenomenon for flow past a spur.
8 To determine the characteristics of a centrifugal pump.
9 To study the momentum characteristics of a given jet.
10 To determine head loss due to various pipe fittings.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

SOIL MECHANICS Lab

Course Code: CVE 206-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of basic definitions of mass, volume, density and simple mathematics.

Objectives:

- The objective of this course is to provide sufficient theoretical and practical knowledge about the properties of soil and earth material.
- To find out the soil properties under dry and wet conditions.
- To experimentally verify the behavior of different types of soil materials under loading.

Course outcomes:

CO-1 Understand the soil composition, its formation and its classification.
CO-2 Able to understand the methods of determination of soil properties useful in various construction activities.
CO-3 Learn the response of water penetration in the soils and its behaviour to wet conditions under loading.
CO-4 Knowledge to find out the shear strength in soils and to relate the theoretical theories.

LIST OF EXPERIMENTS:

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:
   i) Sand replacement method
   ii) Core cutter method
6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

SURVEYING-II Lab

Course Code: CVE 208-P Course Credits: 1.5 Type: Compulsory Contact Hours: 3 hours per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- The objective of this course is to teach about Theodolite and advantage of its use for different measurements.
- To understand different approaches to find the locations and distances of different points, lines desired in survey process.
- To learn to prepare the map or plans to ease the planning and design of engineering structures.

Course outcomes:

CO-1 Use of Theodolite for measurement of distances and angles with corrective measures.
CO-2 Able to understand the procedure of use of Tachometer and tacheometry to determining the height of a particular point and horizontal distance.
CO-3 Learn the use of Triangulation and plot the topographical map.
CO-4 Learn to plot the Base line with different methods meant to provide accuracy in plotting.

LIST OF EXPERIMENTS:

Theodilite:

1. Study of theodolite, measurement of horizontal angle.
2. Measurement of vertical angle.
3. Permanent adjustment.

Tacheometry:

4. Tachometric constants,
5. Calculation of horizontal distance and elevation with the help of Tacheometer.

Curves:

6. Setting of simple circular curves by off- set method: off -set from chord produced,
7. Setting of simple circular curves by off- set method: off -set from long chord.
8. Setting of simple circular curves by deflection angle Method.

Triangulation:

9. An exercise of triangulation
10. Base line measurement.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

PERSONALITY DEVELOPMENT

Course Code: PSY-201-L Course Credit: 0.0 Contact Hours: 03hrs/week Mode: Lecture(L) and Tutorial(T) Examination Duration: 3 Hours	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus; it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Objectives:

1. Holistic development of the students.
2. Make the students to understand self and personality through the interactive task based sessions.
3. To develop the life skills required to lead an effective personal and professional life.

Expected outcomes:

CO-1 Understand the concept of self and personality.
CO-2 Develop the life skills required to lead an effective personal and professional life.

Unit-I

Understanding the concept of self, Self-Esteem, Characteristics of individuals with high and low self-esteem. Self-Confidence, Strategies of building self-confidence. Case Study.

Unit-II

Understanding Personality, Factors affecting Personality: Biological, Psychological
Social, Theories of Personality: Freud, Allport.
Personality Assessment- Neo-Big Five Personality Test; T.A.T

Unit-III

Stress: Causes of Stress and its impact, Strategies of stress management.
Case study.

Unit-IV

Emotional Intelligence: Concept, emotional quotient why Emotional Intelligence matters, Measuring EQ, Developing healthy emotions.
Management of anger and interpersonal relations. Case study.

TEXT BOOK:

1. Burger, J.M. (1990), Personality, Wardsworth: California.
2. Hall C.S., Lindzey, G. (1978), Theories of Personality, New York: Wiley Eastern Limited.
3. Morgan, C.T.King R.A. Weisz, J.R., and Schopler, J. (1987), Introduction to Psychology, Singapore: Mc Graw Hill.
4. Byronb. D., and Kalley, N. (1961). Introduction to Personality: Prentice Hall.
5. Taylor,S.E., (2009). Health Psychology (9th Ed). New Delhi: Tata McGraw-Hill Publishing Company Ltd.

SEMESTER –V

SRUCTURAL ANALYSIS-III

Course Code: CVE-301-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics like differentiation and integration etc.

Objectives:

- The objective of this course is to study the response of different types of structures when subjected to external forces.
- To understand the advanced mechanics involved in complex structures.

Course outcomes:

CO-1 Basic application of mechanics involved in complex structures.
CO-2 Ability to analyze beam and arch structures
CO-3 Ability to obtain the influence lines for statically determinate and indeterminate structures
CO-4 Ability to solve statically indeterminate structures using matrix (stiffness) method

UNIT-I

Influence lines:

Introduction, influence lines for three hinged and two hinged arches, load position for Max.S.F. and B.M. at a section in the span.

Influence Line for statically indeterminate Beams:

Muller-Breslau Principle, I.L. for B.M. & S.F. for continuous Beams.

UNIT-II

Fixed Arches:

Expression for H and B.M. at a section, Elastic centre.

Rolling Loads:

Introduction, Single concentrated load, uniformly distributed load longer than span, shorter than span , two point loads, several point loads, Max.B.M. and S.F.Absolute, Max.B.M.

UNIT-III

Kani's Method:

Analysis of continuous beams and simple frames, analysis of frames with different column lengths and end conditions of the bottom storey.

UNIT-IV

Approximate Analysis of frames:

(i) for vertical loads, (ii) for lateral loads by Portal method & Cantilever method.

Matrix Methods

Introduction, Stiffness Coefficients, Flexibility Coefficients, Development of flexibility & stiffness matrices for plane frame, Global axis and local axis, analysis of plane frame, pin jointed and rigid jointed.

Books Recommended:

1. Indeterminate structures, R.L.Jindal S.Chand & Co.,N.Delhi.
2. Advanced Structural Analysis-A.K.Jain, NemChand & Bros.,Roorkee.
3. Theory of Strucutres,- Vol. I&II,- S.P.Gupta & G.S.Pandit, Tata McGraw Hill, N.Delhi.

DESIGN OF STEEL STRUCTURES-I

Course Code: CVE-303-L Course Credits: 4.0 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 02 hours (D) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus: it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics.

Objectives:

- The objective of this course is to study the concepts of structural steel design through the use of the Indian Standard IS 800 design code.
- To help the students to study the behaviour of different types of steel structures like beams and columns etc.
- To help the students for to analyse the different types of connections for composite members.

Course outcomes:

CO-1 Ability to analyse the material properties of steel.
CO-2 Analyse indeterminate frames and trusses using approximate methods of analysis.
CO-3 Assess shear capacity of beams and design web bearing stiffeners.
CO-4 use of Indian standard code for different steel designs.

UNIT-I

Introduction:

Properties of structural steel. I.S.Rolled sections and I.S. specification.

Connections:

Importance, various types of connections, simple and moment resistant, riveted, bolted and welded connections.

Design of Tension Members:

Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

UNIT-II

Design of Compression Members:

Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members.

Column Bases and Footings:

Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading, design of grillage foundations.

UNIT-III

Design of Beams:

Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling.

UNIT-IV

Gantry Girders:

Introduction, various loads, specifications, design of gantry girder.

Plate Girder:

Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

DRAWINGS:

1. Structural drawings of various types of welded connections (simple and eccentric)
2. Beam to column connections (framed & seat connections)
3. Column bases- slab base, gusseted base and grillage foundation.
4. Plate girder.
5. Roof truss.

Books:

1. Design of steel structures, A.S.Arya & J.L.Ajmani, Nem chand & Bros., Roorkee.
2. Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
3. Design of steel structures, S.M.A.Kazmi & S.K.Jindal, Prentice Hall, New Delhi.
4. Design of steel structures, S.K.Duggal, TMH Pub., New Delhi.

DESIGN OF CONCRETE STRUCTURES-I

Course Code: CVE-305-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus: it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of properties of constituent materials of concrete i.e. cement, fine aggregates, coarse aggregate & sand water.

Objectives: To study the behavior of reinforced concrete structures.

- To analyze the load acting on the structures.
- To analyze the behavior of concrete and steel under different types of load.

Course outcomes:

CO-1 Ability to analyze the material properties of concrete.

CO-2Analyze the design reinforced concrete flexural members and reinforced concrete compression members.

CO-3 Analyze the design for vertical and horizontal shear in reinforced concrete.

CO-4 Analyze the design for deflection and crack control of reinforced concrete members.

UNIT-I

Elementary treatment of concrete technology:

Physical requirements of cement, aggregate, admixture and reinforcement, Strength and durability, shrinkage and creep. Design of concrete mixes, Acceptability criterion, I.S.Specifications,

Design Philosophies in Reinforced Concrete:

Working stress and limit state methods, Limit state v/s working stress method, Building code, Normal distribution curve, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress -strain relationship for concrete and steel.

UNIT-II

Working Stress Method:

Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

Limit State Method:

Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement, design examples.

UNIT-III

Analysis and Design of Sections in shear bond and torsion:

Diagonal tension, shear reinforcement, development length, Anchorage and flexural bond, Torsional, stiffness, equivalent shear, Torsional reinforcement, Design examples.

Columns and Footings:

Effective length, Minimum eccentricity, short columns under axial compression, Uniaxial and biaxial bending, slender columns, Isolated and wall footings, Design examples.

Serviceability Limit State:

Control of deflection, cracking, slenderness and vibrations, deflection and moment relationship for limiting values of span to depth, limit state of crack width, Design examples.

UNIT-IV

Concrete Reinforcement and Detailing:

Requirements of good detailing cover to reinforcement, spacing of reinforcement, reinforcement splicing, Anchoring reinforcing bars in flexure and shear, curtailment of reinforcement.

One way and Two Ways Slabs:

General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Non-rectangular slabs, openings in slabs, Design examples.

Retaining Walls:

Classification, Forces on retaining walls, design criteria, stability requirements, Proportioning of cantilever retaining walls, counter-fort retaining walls, criteria for design of counter-forts, design examples.

Books:

1. Design of Reinforced Concrete Structures,P.Dayaratnam,Oxford & IBH Pub.,N.Delhi.
2. Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand & Bros.,Roorkee.
3. Reinforced Concrete, I.C.Syal & A,K,Goel, A.H,Wheeler & Co.Delhi.
4. Reinforced Concrete Design, S.N.Sinha, TMH Pub.,N.Delhi.
5. SP-16(S&T)-1980, 'Design Aids for Reinforced Concrete to IS:456, BIS, N.Delhi.
6. SP-34(S&T)-1987 'Handbook on Concrete Reinforcement and Detailing', BIS, N.Delhi.
7. **Reinforced Concrete Design – Pillai and Menon, TMH, New Delhi.**

HYDROLOGY

Course Code: CVE-307-L Course Credits: 3.0 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics.

Objectives: The objective of this course is to study Fundamental mechanisms of hydrologic cycle with the probabilistic approach.

- To study the watershed concepts, rainfall-runoff, hydrograph analysis and unit hydrograph theory.
- To study the various hydrologic simulation models,

Course outcomes:

CO-1Ability to compute hydrologic mass balance in a closed basin.

C0-2 Ability to analyze unit hydrographs based on stream flow data.

CO-3 Ability to analyze and compute groundwater drawdown based on water well withdrawal.

UNIT-I

Introduction:

Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry, hypsometric curves.

Precipitation:

Forms and types of precipitation, characteristics of precipitation in India, measurement of precipitation, recording and non recording rain-gauge, rain-gauge station, rain-gauge network, estimation of missing data, presentation of rainfall data, mean precipitation, depth -area -duration relationship, frequency of point rainfall, intensity -duration-frequency curves, probable max. precipitation.

UNIT-II

Evaporation & Transpiration:

Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control, transpiration, evapotranspiration and its measurement, Penman's equation and potential evapotranspiration.

Infiltration:

Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

UNIT-III

Runoff:

Factor affecting run-off, estimation of runoff, rainfall-run off relationships, measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph, measurement of velocity-current meters, floats, area velocity method, moving boat and slope area method, electromagnetic, ultra-sonic and dilution methods of stream flow measurement, stage discharge relationship.

Hydrograph:

Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH, floods, rational methods, empirical formulae, UH method, flood frequency methods, Gumbel's method, graphical method, design flood.

UNIT-IV

Ground Water:

Occurrence, types of aquifers, compressibility of aquifers, water table and its effects on fluctuations , wells and springs, movement of ground water, Darcy's law, permeability and its determination, porosity, specific yield and specific retention, storage coefficient, transmissibility.

Well Hydraulics:

Steady state flow to wells in unconfined and confined aquifers.

Books:

1 Engineering Hydrology by K.Subramanya, TMH, New Delhi
2 Hydrology by H.M.Raghunath.
3 Hydrology for Engineers by Linsely, Kohler, Paulhus.
4 Elementary Hydrology by V.P.Singh.

GEOTECHNOLOGY-I

Course Code: CVE-309-L Course Credits: 3.0 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of Soil properties and behavior of different types of soil.

Objectives: The objective of this course is to study the essential steps involved in a geotechnical site investigation.

- To study the different types of foundation and the factors which govern the most suitable type of foundation for a given problem.
- To determine the bearing capacity of soil, load carrying capacity of pile and earth pressure.

Course outcomes:

CO-1 Student will be able to identify and classify the soil based on standard Geotechnical Engg. practice.
CO-2 Student will be able to plan and implement a site investigation program.
CO-3 Student will be able to determine allowable bearing pressures and load carrying capacity.

UNIT-I

Sub-Surface Exploration

Purpose, stages in soil exploration, depth and lateral extent of exploration, guidelines for various types of structures, ground water observations, excavation and boring methods, soil sampling and disturbance, major types of samplers, sounding methods-SCPT, DCPT, SPT and interpretation, geophysical methods, pressure-meter test, exploration logs.

Drainage & Dewatering

Introduction, ditches and sumps, well point systems, shallow well system, deep well drainage, vacuum method, Electro-osmosis, consolidation by sand piles.

UNIT-II

Shallow Foundations-I

Design criteria for structural safety of foundation(i) location of footing,(ii) shear failure criterion, (iii) settlement criterion, ultimate bearing capacity, modes of shear failure, Rankine's analysis Tergazi's theory, Skempton's formula, effect of fluctuation of G.W.T. , effect of eccentricity on bearing capacity, inclined load, I.S Code recommendations, factors affecting bearing capacity, methods of improving bearing capacity.

Shallow Foundations-II

Various causes of settlement of foundation, allowable bearing pressure based on settlement, settlement calculation, elastic and consolidation settlement, allowable settlement according to I.S.Code. Plate load test and its interpretation, bearing capacity from penetration tests, design bearing capacity.

Shallow Foundations-III

Situation suitable for the shallow foundations, types of shallow foundations and their relative merits, depth of foundation, footing on slopes, uplift of footings, conventional procedure of proportioning of footings, combined footings, raft foundations, bearing capacity of raft in sands and clays, various methods of designing rafts, floating foundations.

UNIT-III

Pile Foundations-I

Introduction, necessity of pile foundations, classification of piles, load capacity, static analysis, analysis of pile capacity in sands and clays, dynamic analysis, pile load tests, negative skin friction, batter piles, lateral load capacity, uplift capacity of single pile, under-reamed pile.

Pile Foundations-II

Group action in piles, pile spacing, pile group capacity, stress on lower strata, settlement analysis, design of pile caps, negative skin friction of pile group, uplift resistance of pile group, lateral resistance, batter pile group.

UNIT-IV

Drilled Piers and Caisson Foundations

Drilled piers-types, uses, bearing capacity, settlement, construction procedure. Caissons-Types, bearing capacity and settlement, construction procedure. Well foundations-shapes, depth of well foundations, components, factors affecting well foundation design lateral stability, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.

Books Recommended

1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao. New Age Int.(P)Ltd..
2 Analysis and Design of Sub-Structures by Swamisaran, IBH & Oxford.
3 Principles of Foundation Enginering By B.M.das, PWS Kent, Boston.
4 Foundation Analysis & Design by J.E.Bowles, McGraw Hills.
5 Design Aids in Soil Mechanics & Foundation Engineering by S.R.Kaniraj, McGraw Hills.
6 Foundation Design by Teng, Prentice Hall, India.

STRUCTURAL MECHANICS -II Lab

Course Code: CVE -301-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours(P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- The objective of this course is to study and verify the theoretical values with the experimental values.
- To study the behavior of different types of structures under loading.
- To help students to build the foundation for different ways of structural analysis.

Course outcomes:

CO-1 Basic application of mechanics involved commonly in the structures.
CO-2 Get the desired values of the resultant action in response to the agitation on the structures.
CO-3 Various techniques to analyse the structures following the slope and deflection approach.
CO-4 Analysis of trusses or forces in each member of trusses using simplified approach.

LIST OF EXPERIMENTS:

1. Experiment on a two hinged arch for horizontal thrust & influence line for Horizontal thrust
2. Experimental and analytical study of a 3-bar pin-jointed Truss.
3. Experimental and analytical study of deflections for unsymmetrical bending of a Cantilever beam.
4. Begg's deformeter- verification of Muller Breslau principle.
5. Experimental and analytical study of an elastically coupled beam.
6. Sway in portal frames - demonstration.
7. To study the cable geometry and statics for different loading conditions.
8. To plot stress-strain curve for concrete.

CONCRETE LAB

Course Code: CVE -305-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- To study the behaviour of materials used in construction projects.
- To determine the compressive strength, workability of concrete mix.
- To study the properties of construction material.

Course outcomes:

CO-1 Able to determine the functional role of ingredients of concrete and apply this knowledge to mix design philosophy.

CO-2 Student will be able to analyze the properties of fresh and hardened properties of concrete.

CO-3 Student will be able to make concrete mix.

Tests on Cement

1 Standard consistency of cement using Vicat's apparatus.
2 Fineness of cement by Sieve analysis and Blaine's air permeability method.
3 Soundness of cement by Le-Chatelier's apparatus.
4 Setting time of cement, initial and final.
5 Compressive strength of cement.
6 Measurement of specific gravity of cement.
7 Measurement of Heat of Hydration of cement.

Tests on Aggregate

1 Moisture content and bulking of fine aggregate.
2 Fineness modulus of coarse and fine aggregates.

Tests on Concrete

1 Workability of cement concrete by (a) Slump test, (b) Compaction factor test, (c) Flow table test,.
2 Compressive strength of concrete by (a) Cube test, (b)Cylinder test
3 Indirect tensile strength of concrete-split cylinder test.
4 Modulus of rupture of Concrete by flexure test
5 Bond strength between steel bar and concrete by pull-out test
6 Non-destructive testing of concrete

Books Recommended:

1 Concrete Manual-M.L.Gambhir, Dhanpat Rai & Sons, N.Delhi.
2 Concrete Technology-M.L.Gambhir, Tata McGeraw Hill, N.Delhi.
3 Concrete Technology – Nevellie, Pearson Education.

GEOTECHNOLOGY LAB

Course Code: CVE -309-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives:

- To determine the different properties of soil.
- To study the bearing capacity and shear strength of soil.
- To analyze the consolidation process of soil.

Course outcomes:

CO-1 Student will be able to investigate the properties of soil at different site.
CO-2 Student will be able to compute the ultimate bearing capacity of soil.
CO-3 Student will be able to analyze the shrinkage of soil.

LIST OF EXPERIMENTS:

1. Grain Size Analysis-Hydrometer method.
2. Shrinkage Limit Determination.
3. Relative Density of Granular Soils.
4. Consolidated Drained (CD) Triaxial Test.
5. Consolidated Undrained (CU) Triaxial Test with Pore Water Pressure measurement.
6. Consolidation Test.
7. Undisturbed Sampling.
8. Standard Penetration Test.
9. Dynamic Cone Penetration Test.
10. Model Plate Load Test.

Books:

1. Soil Testing for Engineers by S.Prakash & P.K.Jain, Nem Chand & Bros.Roorkee.
2. Engineering Soil Testing by Lambi, Wiley-Eastern.
3. Engineering Properties of Soils & Their Measurement by JE Bowles, McGraw-Hill.

SURVEY CAMP

Course Code: CVE -313-P Course Credits: 1 Type: Compulsory Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of performance and attendance in survey camp classes.

Prerequisite: Student should have prior knowledge of the equipments with accuracy.

Objectives:

- The objective of this course is to teach about Theodolite and advantage of its use for different measurements.
- To understand different approaches to find the locations and distances of different points, lines desired in survey process.
- To learn to prepare the map or plans to ease the planning and design of engineering structures.

SEMESTER –VI

DESIGN OF STEEL STRUCTURES - II

Course Code: CVE-302-L Course Credits: 4.0 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 2 hours (D) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics.

Objectives: To Study the permissible stresses and design of water tank.

- To Study the design of steel stack and tower.
- To analyze the various types of cold formed sections.

Course outcomes:

CO-1 Student will be able to design the water tank and tower.
CO-2 Student will be able to analyze the various load acting on Steel stack.
CO-3 Student will be able to design the industrial buildings.

UNIT-I

Elementary Plastic Analysis and Design:

Introduction, Scope of plastic analysis, ultimate load carrying capacity of tension members and compression members, flexural members, shape factor, mechanisms, plastic collapse, analysis, plastic analysis applied to steel beams and simple portal frames and design.

UNIT-II

Design of Water Tanks:

Introduction, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

Design of Steel Stacks:

Introduction, various loads to be considered for the design of steel stacks, design of steel stacks including foundation.

UNIT-III

Towers:

Transmission line towers, microwave towers, Design loads, classification, design procedure and specification.

Cold Formed Sections:

Introduction and brief description of various types of cold formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, design of compression and bending elements.

UNIT-IV

Industrial Buildings:

Loads, general arrangement and stability, design considerations, design of purlins, design of roof trusses, industrial building frames, bracings and stepped columns.

Books:

1. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem Chand & Bros., Roorkee.
2. Design of Steel Structures, P.Dayartnam, Wheeler Pub. Allahabad.
3. IS: 800-1984, Indian Standard Code of Practice for General Construction in Steel.
4. IS-801-1975, Indian Standard Code of Practice for Use of Cold formed light gauge steel structural members in general building construction.

IRRIGATION ENGINEERING – I

Course Code: CVE-304-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics and motion of fluid.

Objectives: To study the different types of irrigation system.

- To study the component of canal distribution system.
- To analyze the effects of water logging.

Course outcomes:

CO-1 Student will be able to understand the importance of irrigation.
CO-2 Student will be able to understand the method of reducing the losses in canal.
CO-3 Student will be able to understand the river training works.

UNIT-I

Introduction:

Irrigation-necessity, advantages, disadvantages, impact of irrigation on human environment , need and development of irrigation in India, crops and crop seasons, ideal cropping pattern and high yielding varieties of crops.

Soil-water relationship and irrigation methods:

Soil-water relationship, root zone soil water, infiltration, consumptive use, field capacity, wilting point, available moisture in soil, GCA, CCA, intensity of irrigation, delta, base period, Kor depth, core period, frequency of irrigation, duty of water, relation between delta, duty and base period, irrigation requirement, flooding methods, border strip method, check basin and furrow method, assessment of irrigation water, sprinkler irrigation, favorable conditions, sprinkler systems, hydraulics of sprinkler irrigation, planning, design and maintenance of sprinkler systems, drip irrigation-components parts, advantages and limitations, suitability of drip irrigation.

UNIT-II

Canal irrigation:

Component of canal distribution system, alignment of channels, losses in irrigation channels, design discharge, silt theories and design of alluvial channels, comparison of Kennedy's and Lacey's theories, canal section and design procedure, Garrets and Lacey's diagrams.

UNIT-III

Water logging and land reclamation:

Water logging-effects, causes and measures of prevention, lining of irrigation channels, types of lining, design of lined channel land drainage, open drains, design considerations, advantages of tile drains, depth of tile drains, layout of closed drains, discharge and spacing of closed drains, diameter of tile drain, outlets for tile drains, maintenance of tile drains, purpose of land reclamation and methods of land reclamation.

UNIT-IV

River Training:

Classification of rivers, river training and its objectives, classification of river training works, methods of river training, marginal embankments, guidebanks, spurs, cutoffs, bank pitching and launching apron.

Canal outlets:

Classification, requirements of a good outlet, design of pipe, APM and open flume outlet, flexibility proportionality, setting and sensitivity of outlet.

Books:

1 Irrigation, Water Resources and Water Power Engg. by P.N.Modi.
2 Fundamentals on Irrigation Engg. by Bharat Singh.
3 Irrigation Engg & Hydraulic Structures by S.K.Garg.
4 Irrigation Engg. by S.K.Sharma.
5 Irrigation-Theory & Practice by A.M. Michael.
6 Irrigation – Theory & Practice by G.L. Asawa

GEOTECHNOLOGY-II

Course Code: CVE-308-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of soil and its properties.

Objectives: To study about the various types of dams.

- To study about the stability of slopes and coffer dam.
- To study about the soil stabilization.

Course outcomes:

CO-1 student will be able to understand the behavior of dam under load.
CO-2 student will be able to understand the construction of braced cut and coffer dam.
CO-3 student will be able to understand the various methods of soil stabilization.

UNIT-I

Earth Dams:

Introduction, types of sections, earth dam foundations, causes of failure and criteria for safe design, control of seepage through the embankment, control of seepage through the foundation, drainage of foundations, criterion for filter design. Introduction to rock fill dams.

Stability of slopes:

Causes of failure, factors of safety, stability analysis of slopes-total stress analysis, effective stress analysis, stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, effect of pore pressure, Fellinius method to locate center of most critical slip circle, friction circle method, Tayler's stability number, slope stability of earth dam during steady seepage, during sudden draw down and during and at the end of construction.

UNIT-II

Braced Cuts:

Depth of unsupported vertical cut, sheeting and bracing for deep excavation, movements associated with sheeting and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.

Cofferdams:

Introduction, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock, inter-lock stresses.

UNIT-III

Cantilever Sheet Piles:

Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method, simplified procedure, cantilever sheet pile, penetrating clay and limiting height of wall.

Anchored Bulkheads:

Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Blum's equivalent beam method.

UNIT-IV

Soil Stabilization:

Soil improvement, shallow compaction, mechanical treatment, use of admixtures, lime stabilization, cement stabilization, lime fly ash stabilization, dynamic compaction and consolidation, Bituminous stabilization, chemical stabilization, pre-compression, lime pile and column, stone column, grouting, reinforced earth.

Basics of Machine Foundations:

Terminology, characteristics elements of vibratory systems, analysis of vibratory motions of single degree freedom system-undamped free vibrations, undamped forced vibrations, criteria for satisfactory action of a machine foundation, degrees of a freedom of a block foundation, Barken's soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

Books Recommended:

1 Analysis and Design of Foundation and Retaining Structures by S. Prakash, Gopal Ranjan & S.Saran, Sarita Prakashan.
2 Analysis and Design of Sub Structures by Swami Saran, IBH Oxford
3 Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, Newage Int.Pub.
4 Soil Dynamic by Shamsher Prakash, McGraw Hill
5 Foundation Design by Teng, Prentice Hall
6 Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsher Prakash, Nem Chand & Bros, Roorkee.
7 Soil Mechanics and Foundation Engineering by Alam Singh

TRANSPORTATION ENGINEERING - I

Course Code: CVE-310-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of pavement sand roads.

Objectives: To study about the different types of pavement sand roads

- To study about the sight distance and design of alignment.
- To study about the traffic control devices.

Course outcomes:

CO-1 student will be able to understand the construction of dam.
CO-2 student will be able to understand the different roads plan.
CO-3 student will be able to understand the traffic control devices.

UNIT-I

Introduction:

Transportation and its importance. Different modes of transportation. Brief review of history of road development in India and abroad: Roman, Tresagne, Telford and Macadam constructions. Road patterns. Classification of roads, Objectives of highway planning, Planning surveys. Saturation system of planning.

Highway Plans, Highway Alignment and Surveys:

Main features of 20 years road development plans in India. Requirements of an ideal highway alignment. Factors affecting alignment. Surveys for highway alignment.

UNIT-II

Cross Section Elements and Sight Distance Considerations:

Cross section elements: friction, carriageway, formation width, land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance.

Design Of Horizontal and Vertical Alignment:

Effects of centrifugal force. Design of superelevation. Providing superelevation in the field. Radius of circular curves. Extra-widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

UNIT-III

Traffic Characteristics And Traffic Surveys:

Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.

Traffic Control Devices:

Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method. Intersections at grade and grade separated intersections. Design of a rotary. Types of grade separated intersections.

UNIT-IV

Highway Materials:Soil And Aggregates:

Subgrade soil evaluation: CBR test, plate bearing test. Desirable properties of aggregates. Various tests, testing procedures and IRC/IS specification for suitability of aggregates. Proportioning of aggregates for road construction by trial and error and Routhfuch method.

Bituminous Materials and Bituminous Mixes:

Types of bituminous materials: bitumen, tar, cutback and emulsions. Various tests, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

Books:

1. Highway Engg. by S.K.Khanna & C.E.G.Justo, Nem Chand & Bros,Roorkee.
2. Principles of Transportation and Highway Engg. by G.V.Rao,Tata McGraw Hill Pub., N.Delhi.
3. Traffic Engg. And Transport Planning by L.R.Kadiyali,Khanna Pub.Delhi.
4. Traffic Engg. by Matson, T.M.,Smith,W.S. and Hurd,P.W.McGraw Hill Book Co., New York.

WATER SUPPLY & TREATMENT

Course Code: CVE-312-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of quality of water.

Objectives: To study about the quality and quantity of surface and ground water sources.

- To study about the Physical, chemical and bacteriological analysis of water.
- To study about the water treatment processes.

Course outcomes:

CO-1 Student will be able to understand the water supply scheme.
CO-2 Student will be able to understand the water quality standards.
CO-3 Student will be able to understand water distribution.

UNIT-I

Water Quantity:

Importance and necessity of water supply scheme. Water demands and its variations. Estimation of total quantity of water requirement. Population forecasting. Quality and quantity of surface and ground water sources. Selection of a source of water supply. Types of intakes.

UNIT-II

Water Quality:

Impurities in water and their sanitary significance. Physical, chemical and bacteriological analysis of water. Water quality standards.

UNIT-III

Water Treatment:

Objectives, treatment processes and their sequence in conventional treatment plant, sedimentation – plain and aided with coagulation. Types, features and design aspects. Mixing basins and Flocculation units. Filtration – mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects). Disinfection principles and aeration.

UNIT-IV

Water Distribution:

Distribution system – Gravity system, Pumping System, Dual system, Layout of Distribution System – Dead End System, Grid Iron System, Ring System, Radial System, their merits and demerits. Distribution Reservoir-functions & determination of storage capacity.

Books:

1. Water Supply and Sewerage: E.W. Steel.
2. Water Supply Engineering: S.R. Kshirsagar.
3. Water Supply Engineering: S.K. Garg.
4. Water Supply Engineering: B.C. Punmia.

TRANSPORTATION ENGINEERING – I LAB

Course Code: CVE -310-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of Bitumen.

Objectives: To study the various properties of bitumen.

- To study the Impact value of the aggregate.
- To determine the Crushing Strength of aggregates.

Course outcomes:

CO-1 Student will be able to understand the different properties of bitumen.
CO-2 Student will be able to determine the quality of aggregates suitable for road construction.
CO-3 Student will be able to understand the strength of aggregates.

LIST OF EXPERIMENTS:

1. Aggregate Impact Test.
2. Los-Angeles Abrasion Test on Aggregates.
3. Dorry's Abrasion Test on Aggregates.
4. Deval Attrition Test on Aggregates.
5. Crushing Strength Test on Aggregates.
6. Penetration Test on Bitumen.
7. Ductility Test on Bitumen.
8. Viscosity Test on Bituminous Material
9. Softening Point Test on Bitumen.
10. Flash and Fire Point Test on Bitumen.

ENVIRONMENTAL ENGINEERING – I LAB

Course Code: CVE-312-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior knowledge of reading the equipments with accuracy.

Objectives: To study the physical, Biological and chemical test on water and wastewater

- To study about the tests which are appropriate for given environmental problem.
- To determine the suspended, dissolved and settable solids in a sewage sample.

Course outcomes:

CO-1 Student will be able to analyze the properties of wastewater.

CO-2 Student will be able to understand how wastewater is treated in the laboratory.

CO-3 Student will be able to write clear technical laboratorial reports.

LIST OF EXPERIMENTS:

1. To determine the pH value of a given sample of water waste water.
2. To determine the turbidity in a given water waste water sample.
3. To determine the acidity of given sample of water waste water.
4. To determine the alkalinity of given sample of water waste water.
5. To determine temporary and permanent hardness in a given water sample.
6. To determine the chlorine does required for a given water sample.
7. To determine total suspended, suspended, dissolved settable solids in a sewage sample.
8. To determine the chloride concentration, in a given sample, of waste water.
9. To determine the sulphate concentration in given water sample.

COMPUTER APPLICATIONS

Course Code: CVE -314-P Course Credits: 1.0 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of computer.

Objectives: To analyze the multi-span Beam and frames using stiffness matrix method.

- To analyze the Plane frame and space Frame using automated software.
- To analyze the three storied and ten storied building using automated software.

Course outcomes:

CO-1 Student will be able to draw maps in auto cad.

CO-3 Student will be able to analyze a multi- storied building.

CO-3 Student will be able to design a part or assembly of parts using CAD software.

1. Computation of roots of a polynomial using.
   a) Bisection method, (b) Newton-Raphson method
2. Solution of linear simultaneous equation suing Gauss Elimination / Gauss Jordan / Triangulation factorization method.
3. Solution of system of non-linear equation using fixed point / Newton Raphson / modified Newton-Raphson method.
4. Analysis of multi-span Beam and frames using stiffness matrix method.
5. Analysis of Plane frame and space Frame using automated software.
6. Analysis of a three storeyed and ten storeyed building using automated software.
7. Introduction to Auto CAD.

Students should be encouraged to write computer programs to solve different civil engineering problems.

SEMESTER –VII

DESIGN OF CONCRETE STRUCTURES - II

Course Code: CVE-401-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of concrete members.

Objectives: To study about the different types of prestressed concrete member.

- To study the design of water tanks and staircases.
- To study the different types of load acting on a building frame.

Course outcomes:

CO-1 Student will be able to understand the prestressed concrete and its importance in construction.
CO-2 Student will be able to design the water tanks and staircases under different situation.
CO-3 Student will be able to understand about the different types of foundation.

UNIT-I

Continuous Beams:

Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear, beams curved in plan-analysis for torsion, redistribution of moments for single and multi-span beams, design examples.

Prestressed Concrete:

Basic principles, classification of prestressed members, various prestressing systgems, losses in prestress, initial and final stress conditions, analysis and design of sections for flexure and shear, load balancing concept, I:S:Specifications .

End blocks-Analysis of stresses, Magnel's method, Guyon's method, Bursting and spalling stresses, design examples.

UNIT-II

Flat slabs and staircases:

Advantages of flat slabs, general design considerations, approximate direct design method, design of flat slabs, openings in flat slab, design of various types of staircases, design examples.

Foundations:

Combined footings, raft foundation, design of pile cap and piles, under-reamed piles, design examples.

UNIT-III

Water Tanks, Silos and Bunkers:

Estimation of Wind and earthquake forces, design requirements, rectangular and cylindrical underground and overhead tanks, Intze tanks, design considerations, design examples.

Silos and Bunkers-Various theories, Bunkers with sloping bottoms and with high side walls, battery of bunkers, design examples.

UNIT-IV

Building Frames:

Introduction, Member stiffnesses, Loads, Analysis for vertical and lateral loads, Torsion in buildings, Ductility of beams, design and detailing for ductility, design examples.

Yield Line Theory:

Basic assumptions, Methods of analysis, yield line patterns and failure mechanisms, analysis of one way and two way rectangular and non-rectangular slabs, effect of top corner steel in square slabs, design examples.

Books:

1. Plain and Reinforced Concrete, Vol.2, Jai Krishna & O.P.Jain, Nem Chand & Bros.,Roorkee.
2. Pre-Stressed Concrete, N.Krishna Raju, TMH Pub.,N,.Delhi.
3. Design of Prestressed Concrete Structures, T.Y.Lin, John Wiley & Sons. N.Delhi.
4. Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand & Bros., Roorkee.
5. IS 1343-1980, IS Code of Practice for Prestressed Concrete.
6. IS 3370-1976(Part I to IV), Indian Standard Code of Practice for Liquid Retaining Structures.
7. IS 456-2000, Indian Standard of Practice for Plain and Reinforced Concrete, IS 1893, 4326 & 13920 Indian Standard Code of Practice for Earthquake Resistant Design of Structures.

IRRIGATION ENGINEERING - II

Course Code: CVE-403-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics.

Objectives: To study the different types of canal fall and canal escape.

- To study the different types of aqueducts.
- To study the different types dams and spillways.

Course outcomes:

CO-1 Student will be able to understand how fall is constructed and silt is removed from canal.

CO-2 Student will be able to analyze the forces acting on the dam.

CO-3 Student will be able to understand the construction of spillways.

UNIT-I

Regulation works:

Canal falls-necessity and location, development of falls, design of cistern element, roughening devices, design of Sarda type fall, and design of straight Glacis fall. Off-take alignment, cross-regulator and distributory, head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes.

UNIT-II

Cross drainage works:

Classification and their selection, hydraulic design aspects of aqueducts, syphon aqueducts, super passage, canal syphon and level crossing, design of transitions.

Diversion canal headworks:

Various components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.

UNIT-III

Storage Headworks:

Types of dams, selection of a site, gravity dam-two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams-constant angle and constant radius arch dam, simple design and sketchs, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters.

UNIT-IV

Spillways and Energy Dissipaters:

Essential requirements of spillway and spillway's capacity, types of spillways and their suitability, Ogee spillways, chute, side channel, shaft and syphon spillways, energy dissipation below spillways, stilling basins, USBR and I.S. Stilling Basins.

Books:

1 Irrigation, Water Resources and Water Power Engineering by P.N.Modi.

2 Fundamentals on Irrigation Engineering by Bharat Singh.

3 Irrigation Engineering and Hydraulic Structures by S.K.Garg.

TRANSPORTATION ENGINEERING – II

Course Code: CVE- 405-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Highways.

Objectives: To study different types of pavements.

- To study construction of bituminous pavements.
- To study highway maintenance and their drainage.

Course outcomes:

CO-1 Student will be able to understand the design of different pavements.

CO-2 Student will be able to understand the different types of earthwork machinery used in construction.

CO-3 Student will be able to understand how highways are maintained.

UNIT-I

Design of Flexible Pavements:

Types of pavements. Flexible and rigid pavements. Components of a pavement and their functions. Factors affecting design of pavements. Design of thickness of a flexible pavement by Group Index method, CBR method (including latest IRC guidelines), Triaxial method and Burmister's method.

Design of Rigid Pavements:

Westergaard's theory, critical locations of loading, load and temperature stresses. Critical combination of stresses. IRC guidelines for determination of thickness of a rigid pavement. Joints: requirements, types, patterns. Spacing of expansion and contraction joints. Functions of dowel and tie bars.

UNIT-II

Highway Construction : Non-Bituminous Pavements:

Brief introduction to earthwork machinery: shovel, hoe, clamshell, dragline, bulldozers. Principles of field compaction of subgrade. Compacting equipments. Granular roads. Construction steps of WBM. WMM. Construction of cement concrete pavements. Slip-form pavers. Basic concepts of the following: soil stabilized roads, use of geo-synthetics, reinforced cement concrete pavements, prestress concrete pavements, roller compacted concrete pavements and fibre reinforced concrete pavements.

Construction of Bituminous Pavements:

Various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of BUSG, Premix carpet, BM, DBM and AC. Brief coverage of machinery for costruction of bituminous roads: bitumen boiler, sprayer, pressure distributer, hot-mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various IRC and MOST specifications.

UNIT-III

Highway Maintenance:
Pavement failures. Maintenance operations. Maintenance of WBM, bituminous surfaces and cement concrete pavements. Pavement evaluation. Benkleman beam. Introduction to various types of overlays.

Highway Drainage and Hill Roads:
Surface drainage: types, brief design. Types of sub-surface drainage. Special characteristics of hill roads: geometrics, hair pin bends, construction of hill roads, drainage of hill roads, maintenance problems of hill roads

UNIT-IV

Highway Economics and Finance
Need of economic evaluation. Highway user benefits and costs. Methods of economic evaluation: benefit cost ratio method, net present value method, internal rate of return method, comparison. Highway finance.

Tunnels
Sections of tunnels: advantages, limitations and suitability of each section. Shaft. Pilot tunnel. Driving tunnel in rocks: sequence of construction operations, full face method, heading and bench method, drift method. Driving tunnels in soft ground: sequence of construction operations, needle beam method, shield tunneling, compressed air tunneling.

Recommended Books

1. Highway Engg *by* S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
2. Principles and Practice of Highway Engg. *by* L.R.Kadiyali, Khanna Publishers, Delhi.
3. Principles of Pavement Design *by* Yoder,E.J & Witczak,M.W., John Wiley and Sons, USA.
4. Tunnel Engineering *by* S.C.Saxena, Dhanpat Rai Publications, N.Delhi.
5. A text book of Tunnel, Bridges and Railway Engg. by S.P.Bindra, Dhanpat Rai Delhi.

SEWERAGE & SEWAGE TREATMENT

Course Code: CVE-407-L Course Credits: 2.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 2 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of sewage.

Objectives: To study different types of sewerage systems.

- To study Design of sewer and different Quality parameters- such as BOD, COD, Solids, D.O
- To study sewage treatment and disposal of sewage.

Course outcomes:

CO-1 Student will be able to understand the design of sewer.

CO-2 Student will be able to understand the characteristics of sewerage waste.

CO-3 Student will be able to understand the treatment of sewerage waste.

UNIT-I

Collection of sewage:

Importance of sanitation, Systems of sewerage – separate, combined and partially separate. Quantity of sanitary sewage and variations. Shapes of sewer – circular and egg shaped. Design of sewers, self-cleansing velocity and slopes, Construction and testing of sewer lines. Sewer materials. joints and appurtenances.

UNIT-II

Sewage Characterization:

Quality parameters- BOD, COD, Solids, D.O., Oil & Grease. Indian Standards for disposal of effluents into inland surface sources and on land.

UNIT-III

Sewage Treatment:

Objectives, sequence and efficiencies of conventional treatment units. Preliminary treatment, screening and grit removal units. Theory and design aspects of primary treatment, secondary treatment- activated sludge process & its modifications, Tricking filter, sludge digestion and drying beds.
Stabilization pond, aerated lagoon, UASB process , septic tank and Imhoff tank.

UNIT-IV

Disposal of Sewage:

Disposal of sewage by dilution – self-purification of streams. Sewage disposal by irrigation (sewage treatment).

Recommended Books:

1. Waste Water Engineering: Metcalf and Eddy.
2. Sewage and Sewage Treatment: S.K. Garg.
3. Sewage and Sewage Treatment: S.R. Krishansagar.
4. Waste Water Engineering: B.C. Punmia.
5. Manual on Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.

CONCRETE STRUCTURES – II (DRAWING)

Course Code: CVE -409-D Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (D) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of drawing.

Objectives: To prepare the drawing sheet of flat slab showing reinforcement details.

- To prepare the drawing sheet of underground and overhead water tanks showing reinforcement details.
- To prepare the drawing sheet of foundation, Silo and Bunker showing reinforcement details.

Course outcomes:

CO-1 Student will be able to draw the sheet of slab, water tank and foundation.
CO-2 Student will be able to analyze the sheet on construction site containing reinforcement detail.

DRAWINGS:

1. Flat slabs
2. Underground and Overhead Water Tanks.
3. Combined Footings, Pile Foundations, Raft foundation.
4. T-Beam Bridge.
5. Silo/Bunker.

IRRIGATION ENGG.DESIGN & DRAWINGS

Course Code: CVE -411-D Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (D) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of drawing.

Objectives: To prepare the drawing sheet of weirs and barrages

- To prepare the drawing sheet of guide banks.
- To prepare the drawing sheet of syphon aqueduct and spillways.

Course outcomes:

CO-1 Student will be able to design the weir, syphon, spillways and guide banks.
CO-2 Student will be able to analyze the sheet on construction site.

Complete Design and Drawing of the following:

1 Design of weirs and barrages on permeable foundation for surface and sub surface flow conditions.

2 Design of Guide Banks.

3 Flood Routing using step by step method.

4 Design of Syphon Aqueduct.

5 Design of Sarda type fall & sloping glacis fall.

6 Seepage line in a homogeneous earth dams on impermeable foundation with horizontal drainage.

7 Design of Ogee Spillway and stilling basin.

Note: Emphasis would be given to the computer aided designs of some of above structures.

PROJECT - I

CVE-429-P GEOTECHNICAL ENGINEERING

Course Credits: 1.5 Type: Compulsory Contact Hours: 3 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of class performance and attendance in Project classes.

Prerequisite: Student should have prior basic knowledge of soil and foundation.

Objectives:

1. To apply knowledge of geotechnical engineering to produce engineers to integrate and build concepts to improve professional leadership and teamwork.
2. To analyze and interpret data related to the geotechnical engineering, as well as to formulate systems within realistic constraints such as economic, environmental.
3. To design project related to geotechnical engineering.

Course outcomes:

CO-1 The students are capable of applying the core and multi- disciplinary knowledge for understanding the problems in Geotechnical engineering and related fields.
CO-2 The students are able to formulate, analyse, design and execute the construction of various types of foundations with appropriate consideration for public health and safety.

OR

CVE-431-P TRANSPORTATION ENGINEERING

Course Credits: 1.5 Type: Compulsory Contact Hours: 3 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of class performance and attendance in Project classes.

Prerequisite: Student should have prior basic knowledge of roads and its construction.

Objectives:

1. To enable the students to have a strong analytical and practical knowledge of planning, designing and solving the transportation problems.
2. To increase the students knowledge and technical know how to be efficient transport engineers.

Course outcomes:

CO-1 The students will have an indepth knowledge in traffic engineering, transport planning, highway design.
CO-2 The students will be able to design the different types of pavements.
CO-3 The students will be able to understand how highways can be prevented from cracks and other defects.

OR

CVE-433-P ENVIRONMENTAL ENGINEERING

Course Credits: 1.5 Type: Compulsory Contact Hours: 3 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of class performance and attendance in Project classes.

Prerequisite: Student should have prior basic knowledge of environment.

Objectives:

1. To study about the Air quality, emissions and pollution control (sampling, modeling and the design of devices to remove particulate and gaseous pollutants).
2. To study about the water and wastewater quality and treatment.
3. To study about the Hazardous and solid waste engineering (site assessment, risk assessment, remediation methods, landfill design).

Course outcomes:

CO-1 An ability to apply knowledge of mathematics, science, and engineering.
CO-2 Able to analyze the properties of water.
CO-3 Able to analyze the parameters which cause pollution.

PRACTICAL TRAINING REPORT

Course Code: CVE -435-P Course Credits: 1.0 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of Training performance and presentations in class.

Prerequisite: Student should have prior basic knowledge of construction.

Objectives:

1. To study design of various elements of construction project.

2. To study the drawing of various project.

Course outcomes:

CO-1 Student will be able to design the project.

CO-2 student will be able to understand how construction project progress**.**

SEMESTER –VIII

BRIDGE ENGINEERING

Course Code: CVE-402-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of different types of concrete & steel bridges.

Objectives:

1. To study the different components of a bridge.
2. To study the loads acting on a bridge.
3. To study the design of a bridge.

Course outcomes:

CO-1 Student will be able to design the bridge

CO-2 Student will be able to understand the different component of bridge.

CO-3 Student will be able to understand the load acting on a bridge.

UNIT-I

Introduction:

Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.

Standard Specifications for Roads and Railways Bridges:

General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

UNIT-II

Design Consideration for R. C. C. Bridges:

Various types of R.C.C. bridges (brief description of each type), design of R.C.C. culvert and T-beam bridges.

UNIT-III

Design Consideration for Steel Bridges:

Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

UNIT-IV

Hydraulic & Structural Design:

Piers, abutments, wing-wall and approaches.

Brief Description:

Bearings, joints, articulation and other details.

Bridge Foundation:

Various types, necessary investigations and design criteria of well foundation.

Books:

1 Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub.N.Delhi.
2 Design of Bridges, N.Krishna Raju, Oxford & IBH, N.Delhi.
3 Bridge Deck Analysis, R.P.Pama & A.R.Cusens, John Wiley & Sons.
4 Design of Bridge Structures, T.R.Jagadish & M.A.Jairam, Prentice Hall of India, N.Delhi.

RAILWAY &AIRPORT ENGINEERING

Course Code: CVE-404-L Course Credits: 3.0 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Rails.

Objectives:

1. To study the different types of rails and gauges.

2. To study the different types of signals used in railways.

3. To study the different elements of airport.

Course outcomes:

CO-1 Student will be able to understand the different types of rails.

CO-2 Student will be able to understand the different types of signal used

CO-3 Student will be able to understand the elements of airport.

UNIT-I

Introduction, Permanent Way And Rails

Rail transportation and its importance in India. Permanent way: requirements and components. Gauges in India and abroad. Selection of gauge. Coning of wheels. Adzing of sleepers. Rails: functions, composition of rail steel, types of rail sections, requirements of an ideal rail section, length of rails. Defects in rails. Creep of rails. Long welded rails and continuously welded rails.

Sleepers, Fastenings and Ballast

Sleepers: functions, requirements of an ideal sleeper. Types of sleepers: wooden, cast iron, steel and concrete sleepers, advantages, disadvantages and suitability of each type. Sleeper density. Fastenings for various types of sleepers: fish plates, spikes, bolts, bearing plates, keys, chairs, jaws, tie bars. Elastic fastenings. Ballast: functions, requirements, types of ballast and their suitability.

UNIT-II

Points and Crossings

Necessity. Turnout: various components, working principle. Switch: components, types. Crossing: components and types. Design elements of a turnout, design of a simple turnout. Layout plan of track junctions: crossovers, diamond crossing, single-double slips, throw switch, turn table, triangle.

Signaling, Interlocking and Train Control

Signals: objects, types and classification. Semaphore signal: components, working principle. Requirements / principles of a good interlocking system. Brief introduction to devices used in interlocking. Methods of control of train movements: absolute block system, automatic block system, centralized train control and automatic train control systems.

UNIT-III

Geometric Design of the Track

Gradients, grade compensation. Super elevation, cant deficiency, negative super elevation. Maximum permissible speed on curves. Tractive resistances, types. Hauling capacity of a locomotive.

Stations, Yards and Track Maintenance

Stations: functions and classification. Junction, non-junction and terminal stations. Yards: functions, types. Marshalling yard: functions, types. Maintenance of railway track: necessity, types of maintenance. Brief introduction to mechanized maintenance, M.S.P and D.T.M.

UNIT-IV

Introduction and Airport Planning

Air transportation, its importance and characteristics, status in India. Layout plan of an airport and its basic elements: terminal area, apron, taxiway, runway, hanger. Aircraft characteristics, their effect on elements of an airport. Site selection of an airport. Classification of airports.

Runway Layout and Pavement Design

Runway orientation, Wind Rose diagram. Basic runway length. Corrections to basic runway length. Runway patterns. Difference between highway and runway pavement. Types of runway pavements. Design factors for runway pavement. Brief introduction to design of thickness of a runway pavement.

Books:

1. A text book of Railway Engineering *by* S.C.Saxena and S.P.Arora, Dhanpat Rai Publicatios, N.Delhi.
2. Railway Track Engg. *by* J.S.Mundray, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.
3. Airport Planning and Design *by* S.K.Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
4. The Planning and Design of Airports *by* Robort Hornjeff, McGraw Hill Book Co.
5. Air Transportation Planning and Design *by* Virender Kumar & Satish Chandra, Galgotia Publications, N.Delhi.

INDUSTRIAL WASTE WATER TREATMENT

Course Code: CVE-406-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus: it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of wastewater.

Objectives:

1.To study the Effects of industrial wastes on stream.
2. To study about the Population equivalent.
3. To Study different types of industries.

Course outcomes:

CO-1 Student will be able to understand how wastewater is treated.
CO-2 Student will be able to understand how the effects industrial waste can be minimized.
CO-3 Student will be able to understand how waste is generated from various industries.

UNIT-I

Effects of industrial wastes on streams, sewerage systems and wastewater treatment plants.

UNIT-II

Minimizing the effects of industrial effluents on waste water treatment plants and receiving streams-conservation of water, process change, reuse of waste water, volume reduction, strength reduction, neutralization, equalization and proportioning.

UNIT-III

Population equivalent. Industrial effluent standards for disposal into inland surface water sources and on land for irrigation.

UNIT-IV

Study of the following Industries from waste generation, quality and its treatment including brief overview of manufacturing process:
Textile, tannery, sugar mill, distillery, dairy, pulp & paper, metal plating, oil refinery, nitrogenous fertilizers, thermal power plants and radio active wastes.

Books:

1. Industrial and Hazardous Waste Treatment by N.L.Nemerow & A.Dasgupta.
2. Industrial Effluents by N.Manivasakam.
3. Waste Water Treatment by M.N.Rao & A.K.Dutta.

ESTIMATION & ACCOUNTS

Course Code: CVE -408-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of construction.

Objectives:

1. To study how total cost of a project is calculated.
2 To study importance and requirements of rate analysis.
3. To study different types of contracts.

Course outcomes:

CO-1 Student will be able to understand how total cost of a project is estimated.
CO-2 Student will be able to understand the different method of estmation.
CO-3 Student will be able to understand the different types of contracts.

UNIT-I

Estimate:

Principles of estimation, units, items of work, different kinds of estimates, different methods of estimation, estimation of materials in single room building, two roomed building with different sections of walls, foundation, floors and roofs, R.B. and R.VC.C. works, Plastering, White-washing, Distempering and painting, doors and windows, lump sum items, Estimates of canals, roads etc.

UNIT-II

Specification of Works:

Necessity of specifications, types of specifications, general specifications, specification for bricks, cement, sand, water, lime, reinforcement; Detailed specifications for Earthwork, Cement, concrete, brick work, floorings, D.P.C., R.C.C., cement plastering, white and color washing, distempering, painting.

UNIT-III

Rate Analysis:

Purpose, importance and requirements of rate analysis, units of measurement, preparation of rate analysis, procedure of rate analysis for items:- Earthwork, concrete works, R.C.C. works, reinforced brick work, plastering, painting, finishing(white-washing, distempering).

UNIT-IV

Public Works Account:

Introduction, function of P.W. department, contract, guidelines, types of contracts, their advantages and disadvantages, Tender and acceptance of tender, Earnest money, security money, retention money, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction.

Books

1. Estimating and Costing for Building & Civil Engg.Works by P.L.Bhasin, S.Chand & Co., N.Delhi.
2. Estimating, Costing & Specification in Civil Engg. by M.Chakarborty, Calcutta.
3. Estimating & Costing in Civil Engg..: Theory & Practice by B.N.Dutta, S.Dutta & Co., Lucknow.
4. Building Construction Estimating by George H.Cooper, McGraw Hill Book Co., New York.

TRANSPORTATION ENGG. - II Lab

Course Code: CVE -426-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of aggregates and bitumen.

Objectives:

1. To study the Flakiness and Elongation Index of aggregates.
2. To study Specific gravity of bitumen.
3. To perform CBR test on soil.

Course outcomes:

CO-1 Student will be able to understand how the different properties of bitumen.
CO-2 Student will be able to understand how the different properties of aggregates.

LIST OF EXPERIMENTS

1. Flakiness and Elongation Index of aggregates.
2. Specific gravity and water absorption test on aggregates.
3. Specific gravity of bitumen.
4. Proportioning of aggregates.
5. Marshall's stability test.
6. Stripping test on aggregates.
7. Determination of bitumen content.
8. CBR lab test on soil.
9. Traffic volume study using videography technique.
10. Traffic speed study using videography technique.

ENVIRONMENTAL ENGG. - II Lab

Course Code: CVE -428-P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

Prerequisite: Student should have prior basic knowledge of wastewater.

Objectives:

1. To study the different properties of a sewage sample.
2. To study the B.O.D, C.O.D of a sewage sample.
3. To determine the Microscopic studies of a sewage

Course outcomes:

CO-1 Student will be able to understand how the different properties of sewage waste.
CO-2 Student will be able to understand how B.O.D, C.O.D of a sample determined.

LIST OF EXPERIMENTS

1. To determine the acidity of a sewage sample.
2. To determine the alkalinity of a sewage sample.
3. To determine total, suspended, dissolved and settable solids in a sewage sample.
4. To determine volatile and fixed solids in a sewage sample.
5. To determine oil and grease in a sewage sample.
6. To determine the chloride concentration in a sewage sample.
7. To determine the sulphate concentration in a sewage sample.
8. To determine the B.O.D. of a given sewage sample.
9. To determine the C.O.D. of a given sewage sample.
10. To determine the T.O.C. of a given sewage sample.
11. To determine the fecal count of a given sewage sample.
12. Microscopic studies of a sewage.

PROJECT-II

CVE-430-P STRUCTURAL ENGINEERING

Course Credits: 2.0 Type: Compulsory Contact Hours: 4 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of class performance and attendance in Project classes.

Prerequisite: Student should have prior basic knowledge of structure.

Objectives:

1. To study the forces acting on structure.
2. To study the design of structure.

Course outcomes:

CO-1 Student will be able to understand how different structure are design.
CO-2 Student will be able to analyse a multi storey building.

OR

CVE-432-P WATER RESOURCES ENGINEERING

Course Credits: 2.0 Type: Compulsory Contact Hours: 4 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of class performance and attendance in Project classes.

Prerequisite: Student should have prior basic knowledge of water containing structure.

Objectives:

1. To study different types of dam located in India.
2. To study design of different types of dams.
3. To study how these dams are prepared.

Course outcomes:

CO-1 Student will be able to understand how different dams are constructed.
CO-2 Student will be able to make a report on these water related projects.

SEMINAR

Course Code: CVE -434-P Course Credits: 2.0 Type: Compulsory Contact Hours: 4 hours (P) per week. Mode: Practical session	**Course Assessment Methods (Internal: 100)** Internal continuous assessment of 100 marks on the basis of class performance, presentations and attendance in Seminar classes.

Prerequisite: Student should have prior basic knowledge of communication skills.

Objectives:

1. To present PPT on topic related to Civil Engineering or assigned by the Teacher.

2. To prepare and present the report (seminar) and submission of the report to the Department.

Course outcomes:

CO-1 Student will be able to improve his communication skills.

CO-2 Student will be able to express his/her innovative thought/ideas.

GENERAL FITNESS & PROFESSIONAL APTITUDE

Course Code: CVE -436-P Course Credits: 1 Type: Compulsory Mode: Overall performance throughout Degree.	**Course Assessment Methods (External: 100)** For the end semester examination the assessment will be done out of 100 marks by the external and internal examiners.

B.TECH (CIVIL ENGINEERING)
Departmental Elective –I
Syllabus

HYDRO ELECTRIC POWER DEVELOPMENT

Course Code: CVE-413-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of water containing structure.

Objectives:

1. To study the various Sources of power
2. To study various Types of Hydro Power Plants.
3. To study various types of Turbines.

Course outcomes

CO-1 Student will be able to understand the different power sources.
CO-2 Student will be able to understand the different Intake structures.
CO-3 Student will be able to understand how turbine work.

UNIT-I

Introduction:

Sources of power, estimation of water power, necessity and importance of harnessing small hydro power, flow duration and power duration curves, load curve, load factors, capacity factors, utilization factors, firm and secondary power.

Types of Hydro Power Plants:

Elements of Hydro power, classification of hydro-power plants, run-of-river plants, storage plants diversion canal development, pumped storage plants, tidal power plants, base load and peak load plants in a power grid.

UNIT-II

Intakes:

Intake structures, functions and their types, components of intakes-forebay, trash racks, gates and valves, force required to operate gates.

Conveyance System:

Penstocks, design criterion, economical diameter anchor blocks, cradles and footings, water hammer, instantaneous closure of power canal, surge tank, surges in canals.

UNIT-III

Turbines:

Types of turbines, specific speed and classification of turbines, synchronous speed, scroll casing, flumes and draft tubes, dimensions of scroll sassing and draft tubes, setting of turbines

UNIT-IV

Power House:

General layout and arrangements of hydro-power number and size of units, sub-structure, spacing of super-structure, underground power stations, tidal power.

Books:

1. Water Power Engineering, Dandekar, M.M. Sharma, K.N.
2. Hydro-Electric Engineering Practice Vol. I, II & III Brown
3. Water Power Engineering, Borrows, H.K.
4. Water Power Development, Vol. I & II, Mosonyi, E.
5. Water Power Engineering, M.M. Deshmukh.

RIVER MECHANICS & FLOOD CONTROL

Course Code: CVE-415-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of river.

Objectives:

1. To study the Indian rivers.
2. To study Flood Mitigation by River Protection.
3. To study Flood Forecasting & Warning.

Course outcomes

CO-1 Student will be able to understand the river flowing in India.
CO-2 Student will be able to understand the Flood Mitigation.
CO-3 Student will be able to analyze how flood are forecasted.

UNIT-I

Introduction:

Indian rivers, flood, flood problems, river morphology, behaviour of river flow, role of sediments in rivers, changes in regimes, river gauging, causes of flood and losses, alleviation of flooding.

Hydrologic Statistics:

Probabilistic treatment of hydrologic data, frequency & probability functions, statistical parameters, fitting a probability distribution, probability distribution fort hydraulic variables.

UNIT-II

Flood Mitigation by River Protection:

Basis of river engineering, flow types, resistance flow , energy slope, backwater effect, three dimensional flow, circular and helicoidal flow, river improvement works, river survey, protection by embankment, discharge capacity, design of dyke, stability analysis of dykes, bank protection, bank recession, types of bank protection works, channel improvement, cutoffs diversion, bypass channel, cutoff channel, floored ways, flood plain zeroing, spreading grounds.

UNIT-III

Flood Mitigation by Reservoirs:

Design factors, storage capacity determinations, sequent peak algorithm method, live storage, ripple mass curve flood routing, flood storage, dead storage, reservoir classification, reservoir sedimentation, distribution of sediments in reservoirs, measurement of sediment yields, sediment load measurement, Mood's method, life of reservoir, reservoir operation based on annual storage and regulation, single and multi purpose reservoirs, gate operation schedule, maximum and minimum flow operation, multi purpose reservoir operation, reservoir economics-cost benefit ratios, optimisation of benefits.

UNIT-IV

Flood Forecasting & Warning:

Basic data, communication network, forecasting techniques and procedures, forecast of rainfall, runoff from rainfall, forecasting stages, peak travel time, forecast reporting flood warning, Engineering methods for flood fighting

Engineering Economics of Flood Control:

Estimation of flood damages, estimation of benefits of flood control, cost benefit analysis of flood control project.

Books:

1 Flood Control & Drainage Engg. by S.N.Ghosh.
2 Hydrology & Flood Control Engg. by S.K.Garg.
3. Hydrology & Water Resources Engg. by K.C.Patra.

IT & CAD APPLICATIONS IN CIVIL ENGG

Course Code: CVE-417-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of CAD.

Objectives:

1. To study the Networking and Web preliminaries such as HTML, CGI, Java & JavaScript.

2. To study the Modeling of structures.

3. To study the design methods of RCC and steel structures.

Course outcomes

CO-1 Student will be able to understand the HTML, JAVA, which help in future growth

CO-2 Student will be able to understand the structure modelling.

UNIT-I

Introduction; Networking and Web preliminaries; HTML, CGI, Java & JavaScript; Audio and Video; Database & SQL, IT in Construction Industry.

UNIT-II

Modeling of structures; Mesh generation, different algorithms and implementation; Visualization of structures, pre- and post-processing, displacement plotting, stress contouring, identification of hot spot in structures, by standard packages and with small programs.

UNIT-III

Introduction to professional Structural Analysis and Design packages; Database system for steel table, unit weight of materials, loading etc. as per IS codes. Analyzing and designing of simple structures with the available software.

UNIT-IV

Checking of results; Design methods of RCC and steel structures, difficulties faced in computer aided decision making.

Books:

(1) Internet and WWW – How to program by Deital, Pearson Edu., New Delhi
(2) Introduction to DBMS by Kahate, Pearson Edu., New Delhi
(3) Core Java (Vol-I) by Horstmann, Pearson Edu., New Delhi
(4) Advanced Structural Analysis by A K Jain, Nem Chand & Bros., Roorkee
(5) SAP and STRUDS Manuals
(6) Finite Element Analysis with Computer Programming by C.S. Krishnamurthy, TMH, New Delhi

ROCK MECHANICS

Course Code: CVE-419-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of rocks.

Objectives:

1. To study the Importance of rock mechanics
2. To study the lab testing of rocks.
3. To study the Stabilization of Rocks.

Course outcomes

CO-1 Student will be able to understand the different types of rocks.
CO-2 Student will be able to understand how rocks are tested.
CO-3 Student will be able to understand the how rocks are stabilize.

UNIT-I

Introduction:
Importance of rock mechanics, composition of rocks, geological and lithological classification of rocks, classification of rocks for engineering purposes, R.Q.D. method of classification of rocks.
Theories of Brittle failure.

Laboratory Testing of Rocks:
Various methods of obtaining rock cores, methods of sample preparation, methods of removing end friction of the rock samples. Compression testing machine, uniaxial compression strength of rock samples, methods of finding tensile strength-direct and indirect methods, Brazilian test, shear box test, triaxial shear test, punch shear test.

UNIT-II

In-situ Testing of Rocks:
Field direct shear test on rock blocks, field triaxial strength, use of flat jacks, chamber test, plate load test, cable jacking test.
Stress Evaluation in Field:
Stress-relief technique(over coring), use of strain gauges, bore hole, deformation cell, photo-elastic stress meter, stress measurement with flat jack. Hydraulics Fracturing Techniques.

UNIT-III

Stabilization of Rocks:
Rock bolting, principle of rock bolting, various types of rock bolts, application of rock bolting. Field testing of rock bolts and cable anchors.
Elastic and Dynamic Properties of Rocks:
Stress-strain behaviour dynamic properties, resonance method and ultra-sonic pulse method.

UNIT-IV

Pressure on Roof of Tunnels:
Trap door experiment, Terzaghi's theory, Bieraumer, kommerel, Protodyakanov theory.
Stress Around the Tunnels:
Basic design and Principles of tunnels in rocks, design of pressure tunnels in rocks.

Books:

1 Rock Mechanics, Vol.I, II, III, IV by Lama,et.al.
2 Fundamentals of Rock Mechanics by Jaeger and Cook
3 Rock Mechanics by Stagg & Zienkiewiez.
4 Rock Mechanics & Design of Structures in Rocks by Obert & Duvell
5 Rock Mechanics & Engineering by Jaeger
6 Art of Tunneling by Schzy.

ELEMENTS OF EARTHQUAKE ENGINEERING

Course Code: CVE-421-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of earthquake.

Objectives:

1. To study the plate tectonics, earthquake distribution and mechanism

2. To study the Single Degree of Freedom Systems

3. To study the Seismic Analysis and Design.

Course outcomes

CO-1 Student will be able to understand how earthquake come on surface of earth from epicentre.

CO-2 Student will be able to understand how earthquake measured.

UNIT-I

Seismology:

Introduction, plate tectonics, earthquake distribution and mechanism, seismicity, seismic waves, earthquake magnitude and intensity, seismic zoning and seismometry.

Single Degree of Freedom Systems:

Various types of dynamic loads, vibration of single degree of freedom system, Free and forced vibrations, types of damping, critical damping, Transmissibility, vibration measuring instruments, response spectrum.

UNIT-II

Multi-degrees of Freedom (MDOF) Systems:

Equation of Motion, normal modes and natural frequencies, semi-definite systems, dynamic vibration absorbers, vibration dampers, principle of orthogonally, Stodolas method, Holzer's method, Matrix method, modal analysis and its limitations. Mode super position method.

UNIT-III

Seismic Analysis and Design:

General principles, assumptions, seismic coefficient method, response spectrum method, strength and deflection, design criterion for structures, significance of ductility, design and detailing for ductility, codal provisions, design examples.

UNIT-IV

Seismic Performance, Repair and Strengthening:

Methods for assessing seismic performance, influence of design ductility and masonry infills, criterion for repair and strengthening, repair and strengthening techniques and their applications, additions of new structural element

Vibrational Control:

General features of structural control, base isolation, active and passive control system. Earthquake resistance design as per I.S.: 1893, I.S. 4326 and I.S. 13920

CONCRETE TECHNOLOGY

Course Code: CVE-423-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of concrete.

Objectives:

1. To study the preparation of concrete, grades of concrete.
2. To study the Concrete Making Materials.
3. To study the Properties of Concrete.

Course outcomes

CO-1 Student will be able to understand how concrete is prepared.

CO-2 Student will be able to understand the different properties of concrete.

CO-3 Student will be able to understand how strength of concrete can be increased.

UNIT-I

1. **Concrete as Structural Material:**
   Introduction, preparation of concrete, grades of concrete, advantages of concrete, concept of quality control.

2. **Concrete Making Materials:**
   Cement, tests on cement (physical tests), types of Portland cement, various types of cement-ordinary Portland cement, rapid hardening cement, low heat cement, sulphate resistant cement, Portland-pozzolona cement, high strength Portland cement, high alumina cement, waterproof cement, white Portland cement, hydrophobic cement, colored Portland cement.
   Aggregates, classification of aggregates based on petrography, size, shape and textures, deleterious substances in aggregates, bulking of fine aggregates, sieve analysis, grading of aggregates as per IS-383-1970, fineness modulus, Maximum size of aggregate, Quality of mixing water, curing water.

UNIT-II

3. **Properties of Concrete:**
   Introduction, workability, factors influencing workability, measurement of workability, requirements of workability, properties of hardened concrete, stress and strain characteristics of concrete, Young's modulus of concrete, creep and shrinkage of concrete, permeability of concrete, durability of concrete sulphate attack, fire-resistance, thermal properties of concrete, construction joints, expansion and contraction joints.

4. **Production of Concrete:**
   Introduction, batching of materials, mixing of concrete materials, transportation of concrete, compaction of concrete, ready mixed concrete, vibrators, Internal vibrators, external vibrators, concrete curing and formwork removal.

UNIT-III

5. **Non-Destructive Testing of Concrete:**
   Significance of Non-Destructive Testing, Rebound Hammer, Ultrasonic pulse velocity techniques, Penetration techniques, pullout tests, vibration methods, Radioactive techniques, Cover meter, core-tests.

6. **Deterioration of Concrete & its Prevention:**
   Causes of concrete deterioration, deterioration by water, surface weir, frost action, deterioration by chemical reactions, sulphate attack, alkali-aggregate reaction, corrosion of embedded steel in concrete, Prevention of deterioration of concrete

UNIT-IV

7. **Repair Technology for Concrete Structures:**
   Symptoms and diagnosis of distress, evaluation of cracks, repair of cracks, common types of repairs, distress in fire damaged structures, underwater repairs.
8. **Special Concrete:**
   Light weight concrete, definition and its properties, applications, high strength concrete, definitions, its properties and applications, Mass Concrete, waste material based concrete, shortcrete, fiber reinforced concrete: Materials Fibres types and properties, ferrrocement, polymer concrete composites, heavy weight concrete for radiation shielding.
9. **Prestressed Concrete**:
   Introduction, basic concepts, classifications and types of prestressing, prestressing systems, properties of materials, pre tensioned and post tensioned concrete elements,

Books Recommended:

1. Gambhir, M.L. 'Concrete Technology'. TMH Pub. N. Delhi
2. Shetty, M.S. 'Concrete Technology', S. Chand & Co. N. Delhi
3. Nevelli, A.M., 'Concrete Technology', Pearson Education

B.TECH (CIVIL ENGINEERING)
Departmental Elective –II
Syllabus

INTRODUCTION TO FINITE ELEMENT METHOD

Course Code: CVE-410-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Mathematics.

Objectives:

1. To study Field conditions, boundary conditions, functional approximation.

2. To study Displacement models, relation between the nodal degrees of freedom.

3. To study Isoparametric, super-parametric and sub-parametric elements.

Course outcomes:

CO-1 Student will be able to analyze different problem.

CO-2 Student will be able to understand the plane truss problem.

UNIT-I

1. **Introduction:**
   Field conditions, boundary conditions, functional approximation, finite differences method, development of finite element method.
2. **Element Properties:**
   Displacement models, relation between the nodal degrees of freedom and generalized coordinates, convergence requirements, natural co-ordinate systems, shape functions, element strains and stresses, development of element stiffness, matrix and equivalent nodal loads, static condensation.

UNIT-II

3. **Isoparametric Elements:**
   Isoparametric, super-parametric and sub-parametric elements, computation of stiffness matrix of isoparametric elements, convergence criteria for isoparametric elements, numerical integration technique using Gauss Quadrature.
4. **One Dimensional Element:**
   Truss element, analysis of plane truss problem, Hermitian beam element, beam on elastic foundation, solution of beam problem.

UNIT-III

5. **Plane Stress and Plane Strain Analysis:**
   Triangular elements, rectangular elements, isoparametric elements, patch test, axisymmetric solid element.
6. **Plane Bending Analysis:**
   Displacement functions, plate bending elements, reduced integration, stress smoothing technique.

UNIT-IV

7. **Conduction Heat Transfer:**
   Formulation of finite element method for heat conduction, various weighted residual techniques, one dimensional heat conduction, two dimensional conduction heat transfer.

8. **Direct Stiffness Method of Analysis and Solution Technique:**
   Assemblage of elements, direct stiffness method, boundary conditions and reactions, Gauss elimination and matrix decomposition.

9. **Finite Element Analysis Software:**
   Pre-and Post-processors finite element analysis software, error estimates and adaptive meshing.

Books:

1. Krishnamurthy, C.S.,'Finite Element Analysis-Theory and Programming', TMH Pub.N.Delhi.
2. Cook, R.D.,Malkus,D.S. and Plesha,M.E.,'Concept and Applications of Finite Element Analysis', John Wiley & Sons, New York.
3. Desai, C.S. and Abel,J.F.,'Introduction to the Finite Element Method', Affiliated East-West Press Pvt.Ltd.N.Delhi.
4. Manicka Selvam,V.K.,'Finite Element Primer', Dhanpat Rai Pub.,N.Delhi.
5. The Finite Element Method – O.C. Zeinkiewitcz, R A Taylor, BH Pub, London

STRUCTURAL OPTIMIZATION

Course Code: CVE-412-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Mathematics.

Objectives:

1. To study Simultaneous failure mode and design.
2. To study linear programming, integer programming.
3. To study Applications to structural steel and concrete members.

Course outcomes

CO-1 Student will be able to analyze different mathematics problem.

CO-2 Student will be able to analyze the advantage and application of concrete and steel.

UNIT-I

Introduction and scope; Simultaneous failure mode and design; Classical extremal problems and calculus of variation.

UNIT-II

Variational principles with constraints, linear programming, integer programming, nonlinear programming, dynamic programming, geometric and stochastic programming.

UNIT-III

Applications to structural steel and concrete members, trusses and frames.

UNIT-IV

Design under frequency constraints, design of layouts.

Books:

(1) Engineering Optimization by Singiresu S. Rao, New Age International Pub., New Delhi
(2) Operational Research in Indian Steel Industry by J. Shah and A. Tripathy, New Age International Pub., New Delhi

GEO-SYNTHETICS ENGINEERING

Course Code: CVE-414-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Mathematics.

Objectives:

1. To study the historical development of geosynthetics.
2. To study the raw materials used for making geosynthetics.
3. To study the durability of geosynthetics.

Course outcomes

CO-1 Student will be able to analyze how geosynthetics are prepared.
CO-2 Student will be able to analyze how geosynthetics are tested.

UNIT I

Basic Description of Geosynthetics:
Historical Development, The Nomenclature, Function, Use around the World, Applications, Development in India.
Raw Materials – Their Durability and Ageing:
Raw Materials, Durability, Degrading Agencies, Polymers, Biological Resistance, Chemical Resistance, Weathering Resistance

UNIT II

Manufacturing Methods:
Fibres, Yarn, Nonwoven Geotextiles, Woven Geotextiles, D.S.F. Fabrics.
Geogrids- Testing and Evaluation:
Factors influencing Testing, Sampling, Physical Properties, and Mechanical Properties under Uniaxial loading, Creep Testing

UNIT III

Erosion Control with Geogrids:
Wind Erosion, Rain Water Erosion, Erosion Control Measures, Placement of Geogrid
Bearing Capacity Improvement with Geogrids:
Advantages, Mechanism, Modes of Failure, Friction Coefficient, Experimental Studies.

UNIT IV

Application of Geosynthetics in Water Resource Projects: Case Study: Dharoidam, Hiran II Dam, Meda Creek Irrigation Scheme, Lining of Kakarpar Canal

Books:

1. Designing with Geosynthetics, (Prentice Hall) by Robert M. Koerner.
2. **Engineering with Geosynthetics, (Tata MacGraw Hill) by G.V. Rao & G.V.S. Raju.**

MACHINE FOUNDATIONS

Course Code: CVE-416-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Machines.

Objectives:

1. To study the theory of vibrations
2. To study the foundations for reciprocating machines
3. To study the foundation for impact machines.

Course outcomes

CO-1 Student will be able to understand the types of machine.
CO-2 Student will be able to analyze the machine foundation.

UNIT-I

1. **Theory of Vibrations:**
   Definitions, harmonic motion, vibrations of a single degree freedom system, transmissibility, theory of vibration measuring instruments.
2. **General Principles of Machine Foundation Design:**
   Types of machines and machine foundations, criteria for satisfactory action of a machine foundation, permissible amplitude, allowable soil pressure, permissible stresses in concrete and steel, permissible stresses in timber.

UNIT-II

3. **Evaluation of Parameters:**
   Modes of vibration of a rigid block foundation, Barken's soil spring constants, determination of coefficients of elastic uniform compression and Elastic uniform shear.
4. **Foundations for Reciprocating Machines:**
   Analysis of block foundation by Barken's theory of linear elastic weightless spring analogy, Indian Standard for design and construction of foundation for reciprocating machine, design procedure, design examples.

UNIT-III

5. **Foundation for Impact Machines:**
   Dynamic analysis, Barken's recommendations for weight and base contact area, IS Code practice for design and construction of foundations for impact machines, design procedure, design examples.
6. **Foundations for Rotary Machines:**
   Special considerations, design criteria, methods of analysis and design.

UNIT-IV

7. **Vibration Isolation and Screening:**
   Active isolation, passive isolation, methods of isolation, wave screening, vibration absorbing materials, planning for vibration isolation.

Books:

1. Dynamics of Bases and Foundations by D.D.Barken
2. Soil Dynamics by Shamsher Prakash
3. Soil Dynamics and Machine Foundations by Swami Saran
4. Principles of Soil Dynamics by B.M.Das

GROUND WATER HYDROLOGY

Course Code: CVE-418-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of ground water.

Objectives:

1. To study the Properties of Aquifers, Formation constants, compressibility of aquifers.

2. To study the design of tubewells in different aquifers

3.To study the Artificial recharge of ground water

Course outcomes

CO-1 Student will be able to understand the properties of Aquifers.

CO-2 Student will be able to understand how tubewells are design.

UNIT-I

Properties of Aquifers, Formation constants, compressibility of aquifers, Equation of motion for steady and unsteady ground water flow in isotropic homogeneous aquifers, Dupit's assumptions. Unconfined flow with a recharge, tile drain problem. Ground water exploration and methods of investigations.

UNIT-II

Effect of boundaries, interference of water, leaky aquifers, Thiem's equilibrium formula for unconfined and confined aquifers and determination of hydraulic properties of aquifers. Partial penetration of an aquifer by a well, spherical flow in a well. Non equilibrium formula for aquifer (unsteady radial flows).

UNIT-III

Tubewells, optimum capacity, silting of tubewell, design of tubewells in different aquifers, tubewell types, parts, bore hole, strains, its types, well pipe, casing pipe, blind pipe. Construction and working of tubewells, site selection, drilling operation, cable tool method, hydraulic method, rivers Rotary Method and drilling fluids, well screen assembly installation, verticality and alignment of tubewells, gravel packing, development of tubewells, sickness, inconstruction and corrosion and failure of tubewells, Pumping equipment and hydraulic testing of pumps.

UNIT-IV

Artificial recharge of ground water, considerations and methods, recharge
techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts and recharge wells.

Books:

1. Groundwater Hydrology, D.K.Todd, John Wiley & Sons Inc.Newyork.
2. Groundwater, H.M.Raghunath, Wiley Eastern Ltd., N. Delhi

DESIGN OF HYDRAULIC STRUCTURES

Course Code: CVE-420-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of dam.

Objectives:

1. To study the gravity dams.
2. To study the arch dam.
3. To study the buttress dams.

Course outcomes

CO-1 Student will be able to analyze the gravity dam.

CO-2 Student will be able to analyze the arch dam.

CO-3 Student will be able to analyze the buttress dam.

Unit-I

1. Gravity Dams

Dam parameters, Criteria for selection of dam sites, Joints & keys, Cooling arrangement, Water stops at joints, Closing gaps, forces acting on dams, Types of loads, Elementary profile of a gravity dam, Step by step method, Stability analysis methods, Safety criteria, Gravity analysis, Internal stress calculations, Graphical determination of shear stress, Effect of foundation elasticity on stresses, Galleries, Behaviour of concrete gravity dam subjected to earthquakes, Thermal stresses.

Unit-II

2. Arch Dams

Development of arch dam, Valleys suited for arch dams, Arch dams layout, Types of arch dams, Appurtenant works, Thin cylinder theory and most economical central angle, Design of arch dam, Suitability at abutments, Effects of foundation elasticity on the behaviours of arch dam.

3. Buttress Dams

Types of buttress dam, Selection of type of buttress dam, Most economical profile having no tension, Design principles, Butterss design by Unit column theory, Basic shape of buttress, Design of multiple arch dam, Provision of spillways and outlet works.

Unit-III

4. Spillways and Energy Dissipaters

Factors affecting design, Components of spillways, Types of spillways, Design principles. Hydraulic design ogee spillway, Side channel spillway, Chute spillway, Syphon spillway, Shaft-spillway, Energy dissipation below spillways, Bucket type energy dissipaters, Design of various types of stilling basins.

Unit-IV

5. Weirs and Barrages

Design of weirs & barrages on permeable foundation, Khosla theory of independent variable, Upstream and downstream protection, Flownets, design of sloping Glacis weir, calculation for hydraulic jump and uplift pressure.

Books Recommended:

1. Engineering for Dams by Creager, Justin & Hinds, Wiley Eastern Pvt. Ltd. Delhi.
2. Concrete dams by R. S. Varshney, Oxford & IBH Pub. Co. Delhi.
3. Dams Part-1 gravity Dams by K. B. Khushalani, Oxford & IBH, Delhi.
4. Design of weirs on permeable foundations, CBIP Pub. No.20, Delhi.

B.TECH (CIVIL ENGINEERING)
Departmental Elective –III
Syllabus

ENVIRONMENTAL IMPACT ASSESSMENT

Course Code: CVE-422-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of environment.

Objectives:

1. To study there use and environmental management.

2. To study the Water quality controls, Drainage basin activities and water pollution.

3. To study the waste management.

Course outcomes

CO-1 Student will be able to analyze the environmental management..

CO-2 Student will be able to analyze the Water disposal methods.

UNIT I

Environment and Human Activity:

Resources, pollution, reuse and environmental management

Management of Aquatic Environment:

Water quality controls, Drainage basin activities and water pollution. The impact of human activity on aquatic resources. The control measures, regional planning

UNIT II

Air Quality Management:

Atmosphere effect of human activity on air quality, waste disposal alternative, Optimization, planning of waste disposal.

UNIT III

Waste Management:

Water disposal methods, Impact of waste disposal of human activity.

Land Use Management:

Impact of land use on human life. Control of hazards in land use, management of land use.

UNIT IV

Environmental Assessment:

National environmental policy, implication of environment assessment in design process. Preparation of assessment, quantification. General requirements of environmental standards. Techniques of setting standards. Case studies of EIA of river valley projects and thermal power projects.

Books:

1. Environmental Impact Analysis by R.K. Jail and L.V. Urban.
2. Environmental Impact Assessment by Canter.
3. Environmental Impact Assessment by J. Glasson.

REMOTE SENSING & GIS

Course Code: CVE-424-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of GIS.

Objectives:

1. To study the Basic concepts of remote sensing.
2. To study the Geographic Information System.
3. To study the applications to Water resources.

Course outcomes

CO-1 Student will be able to understand the different application of GIS.

CO-2 Student will be able to know how GIS work.

UNIT-I

Basic concepts of remote sensing; Airborne and space borne sensors; Data acquisition; Digital image Processing; Restoration; Enhancement; Segmentation feature extraction; Clustering edge detection;

UNIT-II

Geographic Information System; Introduction to Microwave remote sensing and Global Positioning System;

UNIT-III

Applications to Water resources; Land use and erosion; Forestry; Environment and ecology;

UNIT-IV

Use of relevant software for Remote sensing and GIS applications.

Books:

(1) GPS and Surveying using GPS by Gopi S, Tata McGraw Hill
(2) Introduction to GIS by Chang, Tata Mc Graw Hill
(3) An Introduction to Geographical Information Systems by Heywood, Cornelius and Carver, Pearson Edu., New Delhi.

ADVANCED TRAFFIC ENGINEERING

Course Code: CVE-426-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of Traffic.

Objectives:

1. To study Objectives and scope of Traffic Engg.
2. To study Traffic Surveys.
3. To study Traffic Control.

Course outcomes

CO-1 Student will be able to understand the Importance of traffic characteristics
CO-2 Student will be able to understand the Traffic Surveys.
CO-3 Student will be able to understand how signal are design.

UNIT-I

1. Introduction and Traffic Characteristics

Objectives and scope of Traffic Engg. Organizational set up of traffic engineering department in India. Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India. Effects of traffic characteristics on various design elements of the road.

2. Traffic Surveys

Methods of conducting the study and presentation of the data for traffic volume study, speed study and origin and destination study. Speed and delay study. Parking surveys. On street parking, off street parking. Accident surveys. Causes of road accidents and preventive measures. Use of photographic techniques in traffic surveys.

UNIT-II

3. Highway Capacity

Importance. Space and time headway. Fundamental diagram of traffic flow. Relationship between speed, volume and density. Level of service. PCU. Design service volume. Capacity of non-urban roads. IRC recommendations. Brief review of capacity of urban roads.

4. Traffic Control

Types of traffic control devices. Traffic signs, general principles of traffic signing, types of traffic signs. Road markings, types, general principles of pavement markings. Design of rotary. Grade separated intersections. Miscellaneous traffic control aids and street furniture.

UNIT-III

5. Signal Design

Types of signals. Linked or coordinated signal systems. Design of signal timings by trial cycle method, approximate method, Webstor's method and IRC method

6. Traffic Regulation And Management

Need and scope of traffic regulations. Regulation of speed, vehicles and drivers. General traffic regulations. Motor vehicle act. Scope of traffic management. Traffic management measures: restrictions on turning movements, one way streets, tidal flow operations, exclusive bus lanes, traffic restraint, road pricing.

UNIT-IV

7. Traffic And Environment

Detrimental effects of traffic. Vehicular air pollution. Situation in India. Vehicular emission norms in India and abroad. Alternate fuels. Factors affecting fuel consumption. Arboriculture.

8. Computer Application, Traffic Simulation

Computer application in traffic engg., transport planning and public transport. Traffic simulation, advantages. Steps in simulation. Scanning techniques. Introduction to Intelligent vehicle highway system. Various types of IVHS.

Books:

1. Traffic Engg. And Transport Planning *by* L.R.Kadiyali, Khanna Publishers, Delhi.
2. Highway Engg *by* S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
3. Traffic Engg. *by* Matson, T.M., Smith, W.S. and Hurd, F.W., McGraw- Hill Book Co., New York.
4. Traffic Flow Theory *by* Drew, D.R., McGraw- Hill Book Co., New York.

TRANSPORT PLANNING

Course Code: CVE-428-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior basic knowledge of transportation.

Objectives:

1. To study Transport Planning Process
2. To study Transportation Survey
3. To study Trip Generation and distribution.

Course outcomes:

CO-1 Student will be able to understand how transportation work in India.

CO-2 Student will be able to analyze Trip Generation and distribution.

UNIT-I

1. Transport Planning Process

Status of transportation in India. Objectives and scope of transport planning. Urban, regional and national transport planning. Transport planning process, various stages. Land use and traffic.

2. Transportation Survey

Definition of study area. Zoning. Types of surveys. O-D surveys. Inventories of existing transport facilities, land use and economic activities.

UNIT-II

3 . Trip Generation

Trip purpose. Factors affecting trip generation. Trip generation estimation by multiple linear regression analysis, brief review of category analysis, advantages and limitations of these methods.

4. Trip Distribution

Methods of trip distribution. Basic concepts of uniform factor method, average factor method and opportunity model. Trip distribution by gravity model.

UNIT-III

5. Traffic Assignment

Principles of assignment. Assignment techniques. All or nothing assignment. Brief review of multipath assignment, capacity restraint assignment and diversion curves.

6. Modal Split

General considerations for modal split. Factors affecting modal split. Brief introduction to various methods of modal split.

UNIT-IV

7. Evaluation

Need for evaluation. Several plans to be formulated. Testing. Considerations in evaluation. Economic evaluation, basic principles, brief introduction to various methods of economic evaluation, comparison.

8. **Mass Rapid Transit Systems**

Problems of Urban Transport. Introduction to MRTS. Requirements of MRTS. Types of MRTS. MRTS in India

Books:

1. Traffic Engg. And Transport Planning *by* L.R.Kadiyali, Khanna Publishers, Delhi.
2. Highway Engg *by* S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
3. Introduction to Transport Planning *by* Bruton, M.J., Hutchinson Technical Education, London.

PROJECT PLANNING & MANAGEMENT

Course Code: CVE-430-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 1 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Management.

Objectives: To study the project planning activities that accurately forecast project costs, timelines, and quality

- To study project execution and control techniques that result in successful projects.
- To study how the project is started, processed and completed.

Course outcomes:

CO-1 Students will be able to analyze a project life cycle, and can map each stage in the cycle.
CO-2 Students will compute the time needed to successfully complete a project.
CO-3 Students will be able to develop a project scope while considering factors such as customer requirements and internal/external goals,

UNIT-I

Construction Management

Significance, objectives and functions of construction management, types of constructions, resources for construction industry, stages for construction, construction team, engineering drawings.

Construction Contracts & Specifications

Introduction, types of contracts, contract document, specifications, important conditions of contract, arbitration.

UNIT-II

Construction Planning

Introduction, work breakdown structure, stages in planning-pre-tender stages, contract stage, scheduling, scheduling by bar charts, preparation of material, equipment, labour and finance schedule, limitation of bar charts, milestone charts.

Construction Organization

Principles of Organization, communication, leadership and human relations, types of Organizations, Organization for construction firm, site organization, temporary services, job layout.

UNIT-III

Network Techniques in Construction Management-I: CPM

Introduction, network techniques, work break down, classification of activities, rules for developing networks, network development-logic of network, allocation of time to various activities, Fulkerson's rule for numbering events, network analysis , determination of project schedules, critical path, ladder construction, float in activities, shared float, updating, resources allocation, resources smoothing and resources leveling.

Network Techniques in Construction Management-II-PERT

Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem.

UNIT-IV

Cost-Time Analysis

Cost versus time, direct cost, indirect cost, total project cost and optimum duration, contracting the network for cost optimization, steps in time cost optimization, illustrative examples.

Inspection & Quality Control

Introduction, principles of inspection, enforcement of specifications, stages in inspection and quality control, testing of structures, statistical analysis.

Books Recommended

1 Construction Planning & Management by P.S.Gehlot & B.M.Dhir, Wiley Eastern Ltd.
2 PERT & CPM -Principles & Applications by L.S.Srinath. Affiliated East-westPress(P)Ltd.
3 Project Planning & Control with PERT & CPM by B.C.Punmia & K.K.Khandelwal,Lakshmi Pub. Delhi
4 Construction Management & Planning by B.sengupta & H.Guha, Tata McGraw -Hills.

WATER RESOURCES & SYSTEMS ENGINEERING

Course Code: CVE-432-L Course Credits: 3.5 Mode: Lecture(L),Tutorial(T) and Drawing (D) Type: Compulsory Contact Hours: 3 hours (L) + 01 hour (T) per week. Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the Examiner. Question number one will be compulsory and based on the entire syllabus : it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite: Student should have prior knowledge of basic Mathematics differentiation**.**

Objectives: The objective of the course is to the enable students to understand the basic concept of the water resources engineering.

- To access the environmental, economic and social problem associated with the water resource project.

Course outcomes:

CO-1 Student will be able to understand various Stream flow measurements technique.
CO-2 Student will be able to understand the concepts of economic and financial analysis.
CO-3 Student will be able to understand about the water resources systems.

UNIT-I

Water Resources Planning:

Role of water in national development, assessment of water resources, planning process, environmental consideration in planning, system analysis in water planning, some common problems in project planning, functional requirements in multipurpose projects, multipurpose planning, basinwise planning, long term planning. Reservoir planning-dependable yield, sedimentation in reservoir, reservoir capacity, empirical-area reduction method.

UNIT-II

Economic and Financial Analysis:

Meaning and nature of economic theory, micro and macro economics, the concept of equilibrium, equivalence of kind, equivalence of time and value, cost benefit, discounting factors and techniques, conditions for project optimality, cost benefit analysis, cost allocation, separable and non-separable cost, alternate justifiable and remaining benefit methods, profitability analysis.

UNIT-III

Water Resources Systems Engineering:

Concept of system's engineering, optimal policy analysis, simulation and simulation modeling, nature of water resources system, analog simulation, limitations of simulation, objective function, production function, optimality condition, linear, non-linear and dynamic programming, applications to real time operations of existing system, hydrologic modeling and applications of basic concepts.

UNIT-IV

Applications of System Approach in Water Resources:

Applications of system engineering in practical problems like hydrology, irrigation and drainage engineering, distribution network, mathematical models for forecasting and other water resources related problems.

Books:

1 Water Resources Engineering by Linseley and Franzini
2 Economics of Water Resources Engineering by James and Lee.
3 Optimisation Theory and Applications by S.S.Roy
4 Water Resources Systems Planning & Economics by R.S.Varshney.