ANALYSIS OF DETERMINATE STRUCTURES

Course Code	**: 20CV4GCDSA**	**Credits**	**: 4**
L:P:T:S	**: 4:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 04**	**Total hours**	**: 50**

Course Objectives

1. To understand the modelling and analysis of different types of structures such as statically Determinate and indeterminate structures,
2. To classify based on the nature of the structure such as trusses, frames, arches, the type of analysis

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Idealize a structure as a model for theoretical analysis
CO 2	Inspect the structural problems based on available compatibility conditions of equilibrium equations
CO 3	Identify the difference between determinate and indeterminate structures, statically and kinematically
CO 4	Classify the structural type and select a type of analysis based on the structural type and apply the principles of statics or energy principles
CO 5	Solve for the internal forces and support reactions such as axial forces, bending or torsional moments
CO 6	Determine such quantities as structural deflection or rotations of joints in structure

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1										3	2	
CO 2	3	3		1									3	2	
CO 3	2	3											3	2	
CO 4	2	3	3										3	2	

CO 5	3	2	3		3	2
CO 6	3	3	3		3	2

Mapping of Course outcomes to Program Outcomes:

Module	Content	Hours	Cos
1	**STRUCTURAL SYSTEMS AND TRUSS ANALYSIS** Forms of structures, Degree of freedom, Linear and Non-linear structures, one, two, three dimensional structural systems, Determinate and indeterminate structures (Static and Kinematics). Analysis of trusses (Statically determinate) by method of joints, sections.	**10**	**CO1** **CO2**
2	**DEFLECTION OF BEAMS** Macaulay's method, Moment area method, Conjugate beam method for determinate structures.	**10**	**CO2** **CO3**
3	**STRAIN ENERGY** Strain energy and complimentary strain energy, Strain energy due to axial load, bending and shear, Theorem of minimum potential energy, Law of conservation of energy, and Principle of virtual work. Analysis of beams and truss using total strain energy. The Castigliano's theorems and application in the analysis of beams, frames and trusses. Unit load methods for beams and trusses	**10**	**CO4**
4	**ARCHES AND CABLES** Analysis of three hinged circular and parabolic arches with supports at same levels, different levels, Determination of thrust, shear, and bending moment, Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).	**10**	**CO5**
5	**ROLLING LOAD AND INFLUNCE LINES** Concept of ILD, ILD for reactions, SF and BM for determinate beams. ILD for axial forces in determinate trusses. Maximum BM and SF in determinate beams using rolling loads concepts.	**10**	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

1. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1		CO1 CO2

	STRUCTURAL SYSTEMS AND ENERGY CONCEPT: Concept of compatibility conditions and conditions of equilibrium.	
2	DEFLECTION OF BEAMS: Betti's law, Clarke - Maxwell's theorem of reciprocal deflection	CO2 CO3
3	ANALYSIS OF BEAMS AND FRAMES BY STRAIN ENERGY: Analysis of beams using Unit Load Method.	CO4
4	ARCHES AND CABLES: Introduction to two hinged arches and types	CO5
5	ANALYSIS OF BEAMS AND ARCHES: Analysis of cable suspended bridge	CO6

Text Books

1. Theory of Structures, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. Basic Structural Analysis, Azmi Ibrahim, K. U. Muthu, M. Vijay Anand, and Maganti Janardhana, I K International Publishing House Pvt. Ltd, 2001

References

1. Theory of Structures, S P Thimoshenko & D H Young, 2nd Edition, International Student Edition
2. Elementary Structural Analysis, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
3. Structural Analysis, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
4. Analysis of Structures, Thandava Murthy, Oxford University Press, Edition 2005
5. Structural Analysis, Russell C Hibbeler, Maxwell Macmillan International Editions.
6. Basic Structural Analysis, Reddy C. S., Tata McGraw Hill, New Delhi

HYDRAULICS & HYDRALIC MACHINES

Course Code : 20CV4GCHHM
L: P: T: S : 3:0:0
Exam Hours : 03
Hours/Week : 03

Credits : 3
CIE Marks : 50
SEE Marks : 50
Total hours : 40

Course Objectives

1. Analyze the dimensional principals to real flow situations and derive non dimensional numbers. Significance of model studies.
2. To learn types of Hydraulic machines, Efficiency and performance characteristics.
3. To understand the application of momentum principle of impact of jets on plane and curved surfaces.

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

	Course Outcome
CO 1	Ability to solve channel flow problems.
CO 2	Ability to illustrate the boundary layer for objects in fluid flow.
CO 3	Ability to solve scaled modelled dimensions
CO 4	Illustrate the working of various hydraulic and pneumatic devices.
CO 5	Determine the efficiency of centrifugal pump
CO 6	Illustrate the type of turbine required with reference to available head of water and discharge.

Mapping of Course outcomes to Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	2	1										3		2

CO 2	3	1										3		2
CO 3	3	2										3		2
CO 4	3	3	1									3		2
CO 5	3	3	1									3		2
CO 6	3	3	1									3		2

Module	Content	Hours	Co's
1	**UNIFORM FLOW IN OPEN CHANNELS:** Open channel flow, Geometric properties of Rectangular, Triangular, Trapezoidal and Circular channels. Chezy's equation, Manning's equation-problems. Most economical open channels- Rectangular, Triangular, Trapezoidal and Circular channels- problems, Practical applications **NON-UNIFORM FLOW:** Specific energy, Specific energy diagram, Critical depth, Conditions for Critical flow- Theory & problems. Hydraulic jump in a Horizontal Rectangular Channel- Theory and problems. Dynamic equation for Non-Uniform flow in an Open channel.	**8**	**CO1**
2	**MOMENTUM EQUATION AND BOUNDARY LAYER THEORY:** Principle of Conservation of Momentum – Impulse momentum equation, Momentum correction factor, force on a pipe bend. Angular momentum principle – Moment of momentum equation and applications (Problems on sprinkles). Introduction to laminar flow- Velocity and shear stress distribution in laminar and turbulent flow. Boundary Layer Theory- Introduction, Thickness of boundary layer, Laminar Boundary layer, Turbulent Boundary layer and Laminar sub-layer. Separation of Boundary layer, formation of wake. Introduction to Drag and Lift.	**8**	**CO2**

3	**DIMENSIONAL ANALYSIS:** Introduction, Systems of units, Dimensions of quantities, Dimensional Homogeneity of an equation. Analysis- Raleigh's method, Buckingham's Π theorem- problems. Model Studies, Similitude, Non-dimensional numbers: Froude models-Undistorted and Distorted models. Reynold's models-Problems **IMPACT OF JET ON VANES**: Force exerted by a jet on a fixed curved vane, moving curved vane. Introduction to concept of velocity triangles & impact of jet on a series of curved vanes-problems.	**8**	**CO3 CO4**
4	**CENTRIFUGAL PUMPS:** Classification, Priming, methods of priming. Heads and Efficiencies. Equation for work done, minimum starting speed, velocity triangles. Multistage Centrifugal Pumps (Pumps in Series and Pumps in parallel). **RECIPROCATING PUMPS :** Parts of reciprocating pumps, working principle, negative slip, velocity & acceleration variations – No numerical	**8**	**CO5**
5	**PELTON WHEEL:** Introduction to Turbines, Classification of Turbines. Working and velocity triangles. Maximum power, efficiency, working proportions- problems. **FRANCIS TURBINES:** Components, Working and Velocity triangles, Francis Turbine – design problems. Draft Tube: Types, efficiency of a Draft tube. Introduction to software related to hydraulics like FlowMaster, HAMMER etc	**8**	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Unit	**Contents of the unit**	**CO's**
1	**UNIFORM FLOW IN OPEN CHANNELS**: Concept of lined and unlined canal in reservoir planning	**CO1**
2	Boundary line for aircraft and Computational Fluid Dynamics Analysis.	**CO2**
3	**IMPACT OF JET ON CURVED VANES**: Impact of jet on a parallel of curved vanes – practical application	**CO3**
4	Reverse osmosis & Membrane technique.	**CO4**
5	Kaplan Turbine, Cavitations in Turbines	**CO5**

Text Books:

1. 'Fundamentals of Fluid Mechanics' – P N Modi& S M Seth, Standard Book House, 2009
2. 'A Text Book of Fluid mechanics & Hydraulic Machines'- R.K.Rajput, S.Chand& Co, New Delhi, 2006 Edition.
3. Hydraulic Machines by Jagadish La

References:

1. 'Fluid Mechanics and Turbo machines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.
2. 'Introduction to Fluid Mechanics' – Robert w. Fox: Philip j. Pritchard: Alan t. McDonald, Wiley India, New Delhi, 2009 Edition.

3. 'Introduction To Fluid Mechanics' – Edward j. Shaughnessy, jr; Ira m. Katz:; James p Schaffer, Oxford University Press, New Delhi, 2005 Edition.

SOIL MECHANICS

Course Code	**: 20CV4GCSME**	**Credits**	**: 3**
L:P:T:S	**: 3:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives:

1. To enable the students to acquire the knowledge of basics of soil mechanics
2. To understand the origin of soil, classification, basic terms and properties of soil
3. To design of civil engineering sub structures

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

	Course Outcome
CO 1	Identify and classify the soils
CO 2	Determine various index and engineering properties of soil
CO 3	Compute settlements under footings and loaded areas

CO 4	Analyse the soil parameters which are useful in the design of sub-structures
CO 5	Determine the shear strength and consolidation of soil
CO 6	Analyse the compaction properties of soil.

Mapping of Course outcomes to Program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	1		2										2	3	
CO 2	1	1	2										2	3	
CO 3		2											2	3	
CO 4		2	3										2	3	
CO 5				1									2	3	
CO 6		2											2	3	

Module	Content	Hours	Co's
1	History of soil mechanics, Definition. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships. **CLASSIFICATION OF SOILS**: Index properties of soil, Purpose of soil classification, Particle size classification – MIT classification and IS classification. IS classification - Plasticity chart and its importance, Field identification of soils.	**8**	**CO1 CO2**

2	**CLAY MINERALOGY AND SOIL STUCTURE**: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite **FLOW OF WATER THROUGH SOILS:** Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage Velocity, and coefficient of percolation, quick sand phenomena, Capillary Phenomena.	**8**	**CO1 CO3**
3	**SHEAR STRENGTH OF SOIL**: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept of total stress**,** Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay. **COMPACTION OF SOIL**: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle,	**8**	**CO3 CO4**
4	**DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL**: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (Cc, av, mv and Cv). Measurement of shear parameters- Direct shear test, unconfined compression test and Triaxial compression test **,** Test under different drainage conditions. Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method).	**8**	**CO1 CO5**
5	**SUBSURFACE EXPLORATION**: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of geophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.	**8**	**CO1 CO6**

NOTE:

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION: Origin of soil and formation of soil, Specific gravity of soil solids (Pycnometer and density bottle method)	**CO1,CO2**
2	CLAY MINERALOGY AND SOIL STUCTURE: Textural classification	**CO1,CO3**
3	COMPACTION OF SOIL: Superficial velocity, effective stress and Neutral stress	**CO3,CO4**
4	COMPACTION OF SOIL: Compacting equipment	**CO1,CO5**
5	DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL: Vane shear test	**CO1,CO6**

TEXT BOOKS:

1. Soil Mechanics and Foundation Engg.-Punmia B.C. (2005), Laxmi Publications Co. , New Delhi.
2. Principles of Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

REFERENCES BOOKS:

1. Foundation Analysis and Design- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. Soil Engineering in Theory and Practice- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. Basic and Applied Soil Mechanics- GopalRanjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. Geotechnical Engineering- Donold P Coduto Phi Learning Private Limited, New Delhi
5. Geotechnical Engineering- Shashi K. Gulathi&ManojDatta. (2009), " TataMcGraw Hill.
6. Text Book of Geotechnical Engineering- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.
7. Numerical Problems, Examples and objective questions in Geotechnical Engineering- NarasimhaRao A. V. &Venkatrahmaiah C. (2000), Universities Press., Hyderabad.

WATER SUPPLY ENGINEERING

Course Code	**: 20CV4GCWSE**	**Credits**	**: 3**
L: P: T: S	**: 3:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives

1. To provide basic concepts of estimation of various demands of water and selection of sources of water,

2. To characterize water quality, design of various water supply components and miscellaneous treatment to the water.

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

	Course Outcome
CO 1	Forecast the future water demand
CO 2	Check the quality of water for drinking
CO 3	Design a water treatment plant
CO 4	Estimate the method the make water potable
CO 5	Select the source of water and distribution network for given location
CO 6	Identify different types of intakes

Mapping of Course outcomes to Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	1	1												
CO 2	3	2											2	2	
CO 3	3	2											2	2	
CO 4	3	3	1										2	2	
CO 5	3	3	1										2	2	2
CO 6	3	3											2	2	2

Module	Content	Hours	Co's
1	**INTRODUCTION:** Hydrologic cycle (Horton's representation). Water budget equation **DEMAND OF WATER*:*** Types of water demands. Per capita consumption –factors affecting per capita demand, population forecasting, different methods- variations in demand of water, peak factors, design periods & factors governing the design periods .	**8**	**CO1**
2	**SOURCES**: Surface and subsurface sources – suitability with regard to quality and quantity. **COLLECTION AND CONVEYANCE OF WATER**: Intake structures – different types of intakes; factor of selection and location of intakes.	**8**	**CO6**
3	**QUALITY OF WATER**: Objectives of water quality management, wholesomeness &palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS:3025 and IS:1622) using analytical and instrumental techniques. **WATER TREATMENT**: Objectives – Treatment flow-chart. Aeration- Principles, types of Aerators **SEDIMENTATION**: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test.	**8**	**CO2** **CO3** **CO4**
4	**FILTRATION**: Mechanism – theory of filtration, types of filters - construction, operation and cleaning. Operational problems in filters. **DISINFECTION:** Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine.	**8**	**CO3** **CO4**
5	**SOFTENING:** Definition, methods of removal of hardness by lime soda process and zeolite process. **ADVANCED TREATMENT**: Removal of colour, odour, taste by adsorption techniques, Reverse Osmosis process **DISTRIBUTION SYSTEMS**: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems. Types of Valves and their uses in water supply. Introduction to water distribution network software like WaterGEMS, OPENFLOW etc	**8**	**CO3** **CO4** **CO5**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2.Assignment Questions should be from self-study component only.

Self Study Component		
Module	Contents of the unit	CO's
1	INTRODUCTION : Human activities and environmental pollution	CO1
2		CO6

	COLLECTION AND CONVEYANCE OF WATER: Pipe appurtenances.	
3	WATER TREATMENT: Drinking water standards BIS & WHO guidelines. Chemical feeding, flash mixing, and clariflocculator.	CO2,CO3,CO4
4	DISINFECTION: Treatment of swimming pool water (SL)	CO3,CO4
5	DISTRIBUTION SYSTEMS: Reverse osmosis, Membrane technique. Plumbing	CO3,CO4,CO5

Text Books:

1. Water Supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Ministry of Urban Development, New Delhi

References Books:

1. Karia, G.L., and Christian, R.A., (2006), Wastewater Treatment – Concepts and Design Approach, Prentice Hall of India Pvt. Ltd.,New Delhi.
2. Hammer, M.J., (1986), Water and Wastewater Technology –SI Version, 2nd Edition, John Wiley and Sons.
3. Metcalf and Eddy, (2003), Wastewater Engineering, Treatment and Reuse ,4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.
4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986),Environmental Engineering, McGraw Hill Book Co.
5. Raju, B.S.N., (1995), Water Supply and Wastewater Engineering, Tata McGraw Hill Pvt. Ltd., New Delhi.
6. Sincero, A.P., and Sincero, G.A., (1999), Environmental Engineering, A Design Approach–Prentice Hall of India Pvt. Ltd., New Delhi.

HIGHWAY AND BRIDGE ENGINEERING

Course Code : 20CV4GCHBE | **Credits : 3**
L:P:T:S : 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives:

1. To understand the basic concepts of Transportation engineering.
2. To classify the need of modes of transportation systems
3.To understand the basic concept of Bridge Engineering

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

	Course Outcome
CO 1	Analyse theconcept of transportation Engineering and its role in Nation development
CO 2	Distinguish the principle of planning, surveys, collection of data
CO 3	Classify the need of modes of transportation systems, principles of highway alignment design, realignment, drawings
CO 4	Principles of geometric design of various highway components
CO 5	Evaluate the concept of construction, equipments, material specifications as per IRC,
CO 6	Classify the bridges, general principles of bridge design and IRC guidelines for selection of type of bridge.

Mapping of Course outcomes to Program outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	2												3	2	2
CO 2		1	3										3	2	2
CO 3	1	2	2										3	2	2
CO 4			3										3	2	2
	1	2	2	1			1						3	2	2

CO 5														
CO 6	1	2	2									3	2	2

Module	Content	Hours	Co's
1	PRINCIPLES OF HIGHWAY ENGINEERING: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakarcommittee recommendations, and its implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute. HIGHWAY DEVELOPMENT AND PLANNING: Road types and classification, road patterns, planning surveys, masterplan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year road development plans and Policies.	**8**	**CO1 CO2 CO3**
2	HIGHWAY ALIGNMENT AND SURVEYS: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects HIGHWAY GEOMETRIC DESIGN – I: Importance, Terrain classification, Design speed, Factors affecting geometric design, Cross sectional elements-Camber- width of pavement Shoulders- Width of formation- Right of way, typical cross sections	**8**	**CO2 CO3 CO4**
3	HIGHWAY GEOMETRIC DESIGN – II: Sight Distance Restrictions to sight distance- Stopping sight distance & Overtaking sight distance-overtaking zones- Examples on SSD, OSD and ISD- Sight distance at intersections, Horizontal alignment-Radius of Curve- Superelevation – Extra widening Transition curve and its length, setback distance – Examples, Vertical alignment-Gradient-summit and valley curves with examples.	**8**	**CO4**
4	PAVEMENT MATERIALS: Subgrade soil –functions and desirable properties-HRB soil classification-determination of CBR and modulus of subgrade reaction-Examples on CBR and Modulus of subgrade reaction with corrections, Aggregates- Desirable properties and list of tests, Bituminous materials- Desirable properties of bitumen, bitumen, cutback and emulsion-List of tests and its importance PAVEMENT CONSTRUCTION: Earthwork: cutting-Filling, Preparation of subgrade, Specification and construction of i) Granular	**8**	**CO5**

	Subbase, ii) WBM Base, iii) WMM base, iv) Bituminous Concrete, and PQC v) concrete roads		
5	Bridge - Development of bridges & Types, Components of a bridge, Classification of bridges, Importance of bridges, Selection of bridge site, I.R.C. Guidelines, Essential requirements of a good foundation, Location, Stability, Settlement, General principles of design of bridge foundations, Abutments – Definition, Conditions of stability, Functions, Dimensions, Types Forces acting on an abutment, Piers – Function, Types Forces acting on a pier, Conditions of stability, Dimensions, Location, Abutment pier. Wing walls, Types, LOADING ON BRIDGES, Classification of suspension bridges, Types, Advantages and disadvantages of suspension bridges, Materials for super-structures, Cement concrete, Masonry, Steel, Timber. Composite bridges, pre-cast bridge decks	**8**	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

3. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	PRINCIPLES OF TRANSPORTATION ENGINEERING: present development in transportation sector	**CO1,CO2,CO3**
2	HIGHWAY ALIGNMENT AND SURVEYS: Application of GIS in surveying	**CO2,CO3**
3	PAVEMENT MATERIALS: Modern methods of construction practice	**CO2,CO3,CO4**
4	PAVEMENT CONSTRUCTION: modern method of pavement construction and construction equipments used in practice	**CO5**
5	Evaluation of sub structures, Design of culvert	**CO6**

Text Books:

3. Highway Engineering, S K Khanna and C E G Justo, Nem Chand Bros, Roorkee.
4. Highway Engineering, L R Kadiyali, Khanna Publications, New Delhi
5. Ponnuswamy, S. "Bridge engineering", Tata McGraw-Hill, 2008.
6. Bangash, M. Y. H. "Prototype bridge structures: analysis and design", Thomas Telford, 1999.
7. Bennett, David, "The architecture of bridge design", Thomas Telford, 1997.

References:

7. Transportation Engineering, K P Subramanium, Scitech Publications, Chennai.
8. Transportation Engineering, James H Banks, Mc.Graw Hill Publications, New Delhi

1. Victor D. J, “Essentials of Bridge Engineering”, Oxford and IBH
2. Raju N. K, “Design of Bridges”, Oxford and IBH
9. Indian Road Congress (IRC) 58-2002, IRC 37-2001
10. Specifications for Roads and Bridges – MoRT&H, IRC, New Delhi

ENGINEERING GEOLOGY, REMOTE SENSING & GIS LAB

Course Code : 20CV4GLGRG | **Credits : 2**
L:P:T:S : 0:1:2 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 04 | **Total hours : 30**

Course Objectives

1. Exposed to the study and identification of various rocks and minerals and characterize them based on their physical properties.
2. Study of toposheets, topographical and geological maps
3. Conduct problems related to dip, strike and orientation/ properties of rocks to plan and locate suitable sites for locating Geo-engineering structures.
4. Appreciate the advantages of emerging S&T fields like RS, GIS and GPS along with their applications in geo-engineering by field visit / practical demonstrations.

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Identify different groups/ verities of minerals and their application in civil engineering and for other industrial purposes
CO 2	Identify different groups/varieties of rocks and their uses as building and construction materials for civil engineering and allied infrastructures.
CO 3	Acquire skill to read/interpret the topo sheets/ maps and understand various features in them such as topography, drainage, cultural aspects, elevation, scale etc
CO 4	Analyze the orientations of rock formations regard their dip, strike and orientations, thickness of strata, bedding planes etc. for planning infrastructures
CO 5	Visualize rock orientations, measure inclinations, predict lateral and vertical extension of subsurface rock strata and decipher their 3D.
CO 6	Use geological maps and sections to know the various rock structures namely, faults, folds, joints, lineaments, unconformity etc which bear great significance in site selection for bore wells and also in siting artificial recharge structures and other civil structures.

Mapping of Course outcomes to Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3

CO 1	3	2	2												2
CO 2	3	2	1												2
CO 3	3	3	2	2											2
CO 4	2	1	1	2											2
CO 5	3	1	3												2
CO 6	2	1	2												2

Experiment	Content	Hours	CO's
1	**Mineralogy-** Describe and identify the Quartz group; Quartz crystal, Rose quartz, White Quartz, milky & grey quartz, agate, jasper, opal, amethyst and Flint. Feldspar group: Plagioclase, Orthoclase, Microcline. Mica Group: Biotite and Muscovite, Amphibole group: Hornblende, based on their physical properties, chemical composition with engineering uses.	**3**	**CO1, CO2**
2	Describe and identify– Garnet, Corundum, Gypsum, Asbestos, and Kaolin. Carbonates-calcite, dolomite and magnesite, Oxides; magnetite, hematite, limonite, chromite, pyrolusite and bauxite; sulphides; chalcopyrite, galena and pyrite based on their physical properties, chemical composition with engineering uses.	**3**	**CO3, CO4**
3	**Igneous Rocks:** Identification and description of Granites, Syenite, Gabbro, Dunite, Granite porphyry, Felsite porphyry, Pegmatite and Dolerite as well as Basalt based on colour index, texture/structure and Mineral composition citing their mode of occurrence and uses.	**3**	**CO2, CO5**
4	**Sedimentary and Metamorphic rocks:** Identifications and description of Conglomerate and Breccia, Sand stones and Shale, Lime stones, Kanker and Laterite. Gneiss, Marble, Slates, Quartzites, Schists and Charnockite based on colour, texture/structure and Mineral composition citing their mode of occurrence and uses	**3**	**CO6, CO3**
5	Problems on Dip and strike of beds: To find out the dip and strike of the rocks and ore-bodies to select suitable sites for civil engineering structures.	**3**	**CO3, CO2**
6	Problems on Thickness and Borehole data of rocks in the regions of dams, tunnels, bridges and highways: triangular and square methods	**3**	**CO5, CO1**

7	Interpretation of Geological maps- Inclined and Folded strata with Igneous Intrusions.	**3**	**CO4, CO3**
8	Interpretation of Geological maps- Faulted strata with unconformities and Igneous Intrusions. In selecting the sites for various civil engineering structures such as dams, railway, and road projects etc	**3**	**CO2, CO1**
9	Surveying using Garmin handed GPS [Creating a waypoint (Latitude, Longitude and Elevation from MSL), Measuring a distance and area, Download the data from GPS to Computer system and using Expert GPS software and analyse the data and superimposed on Google earth and create elevation profile].	**3**	**CO3, CO2**
10	Visual interpretation of Toposheets and Satellite imageries, Digitization and Mapping by ArcGIS/CAD/QGIS techniques, creating shapefiles (point, line and polygon), Adding the Data (shp or excel file), dealing with attribute table (create or remove, data types), calculating area, X and Y Coordinates, Clipping the layers using Arc GIS software/QGIS open-source software. Download DEM data from USGS/NASA/Bhuvan website etc and creating contour, slope etc.	**3**	**CO5**
11	Dealing with projection systems, cutting and merging the polygons, selection by attribute, dealing with symbology labelling of data according to attribute, creating a layout for the final map preparation, Exporting the Map. Creating buffer zone, creating polygon grid using fishnet, Spatial data download, shape file, country boundary, administrative boundary any country download, download shape (Building, Road, Waterbody, rail, climate etc) - using Arc GIS software/QGIS open-source software. Demo on Resistivity meter	**3**	**CO5**

Reference Lab Manual:

1. Gurrappa, “Standard geological and topographical maps”.
2. Satyanarayana Swamy, Engineering geology lab manual”
3. Ravi, P Gupta. “**Remote sensing Geology**”, Springer Verilag, New York.
4. Anji Reddy, M. “**Remote sensing and GIS**”, B S Publlications, 2008.

COMPUTER AIDED DESIGN AND DRAFTING LAB

Course Code : 20CV4GLCAD | **Credits : 2**
L:P:T:S : 0:1:2 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 04 | **Total hours : 30**

Course Objectives

1. To learn the basic building drawing and components of building
2. To give an exposure to the bye laws, orientations, building standards
3. To prepare students for future Engineering positions

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Utilize Auto cad basic tools for building drawing.
CO 2	Model two dimensional drawings with Auto CAD
CO 3	Adapt suitable building standards for planning and designing of buildings.
CO 4	Identify the bye laws and building design as per government norms.
CO 5	Convert sketches into engineered drawings (Structural Drawings).

Mapping of Course outcomes to Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	3	3	3	2	3										1
CO 2	3	3	3	2	3									3	
CO 3	3	3	3	2	3									3	3
CO 4	3	3	3	1	3									3	3
CO 5	3	3	3	1	3									3	3

Unit	Content	Hours	CO's
1	**INTRODUCTION TO BUILDING DRAWING:** 1.1 Preparing geometrical drawing of component of buildings i) Stepped wall footing and isolated RCC column footing ii) Continuous beam iii) RCC dog legged and open well stairs 1.2 Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.	**10**	**CO1, CO2**
2	**Preparation of AUTOCAD Drawings** 2.1 Using Auto Cad Development of plan, elevation, section and schedule of openings from the given line diagram of two bed room residential buildings and to show the C/S of foundation, lintel & chejja. 2.2 Using Auto cad developing the Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building i) Primary health center, ii) Primary school building, iii) College canteen 2.3 Using Auto CAD For a given single line diagram, preparation of water supply, sanitary and electrical layouts 2.4 Introduction 3D drawing	**20**	**CO3, CO4**

NOTE: ALL THE MANUAL DRAWINGS ARE DONE IN GRAPH SHEETS ONLY

Reference Lab Manual:

1. National Building Code 2005 BIS, New Delhi.
2. IS SP34, BIS New Delhi
3. "Building Drawing", by Shah M. H. And Kale C. M., Tata McGraw Hill Publishing Co
4. CAD Laboratory - M A Jayaram, D S Rajendraprasad, Sapna Publications.
5. Karnataka Municipalities Model Building Bye-Laws 2017