DESIGN OF STEEL STRUCTURES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER –VI

SubjectCode	21CV61	CIE	50
NumberofLectureHour/Week	2L+1T	SEE	50
Total Number of Lecture Hours	42	Exam Hours	03

CREDITS –03

Course Objectives: This course will enable students to

1. Understand advantages and disadvantages of steel structures, steel code provisions and plastic behavior of structural steel.
2. Learn Bolted connections and Welded connections.
3. Design of compression members, built-up columns and columns splices.
4. Design of tension members, simple slab base and gusseted base.
5. Design a beam section

CO#	Course Outcomes	POs	PSOs
CO1	Possess a knowledge of Steel Structures Advantages and Disadvantages of Steel structures, steel code provisions and plastic behavior of structural steel		
CO2	Understand the Concept of Bolted and Welded connections.		
CO3	Understand the Concept of Design of compression members, built-up columns and columns splices.		
CO4	Understand the Concept of Design of tension members, simple slab base and gusseted base.		
CO5	Understand the Concept of Design of beams.		

Course Articulation Matrix / Course mapping:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2										2	2	1	
CO2	2	3	2									2	2	2	
CO3	2	3	2									2	2	2	
CO4	3	3	2									2	2	2	
CO5	3	3	2									2	2	2	

Modules	RBT Level/hrs
Module -1 **Introduction:** Advantages and Disadvantages of Steel Structures, Limit state method, Limit State of Strength, Structural Stability, Serviceability Limit states, Failure Criteria Design Consideration, Loading and load combinations, IS code provisions, Specification and Section classification.	08 hours L1, L2

Module -2 **Bolted Connections:** Introduction, Types of Bolts, Behavior of bolted joints, Design of High Strength friction Grip (HSFG) bolts Design of Simple bolted Connections (Lap and Butt joints)- Advantages and Disadvantages, Eccentric bolted connection. **Welded Connections:** Introduction, Types and properties of welds, Weld Defects Simple welded joints for truss member, Advantages and Disadvantages. Numerical	10 Hours L1, L2, L3, L5
Module -3 **Design of Compression Members:** Introduction, Sections used for compression members, Behavior & types of failures, Effective length of compression members, Design of compression members. Design of Laced and Battened Systems. Numerical	08 Hours L1, L2, L3, L5
Module -4 **Design of Column Bases:** Design of Simple Slab Base and Gusseted Base. **Design of Tension Members:** Introduction, Types of Tension members, Behaviour of Tension members modes of failure, Slenderness ratio, Factors affecting the strength of tension members, Design of Tension members and Lug angles, Splices. Numerical	08 Hours L1, L2, L3, L5
Module -5 **Design of Beams:** Types of Rigid steel beam sections-Behaviour of Beams in flexure, Beam types Beam to Beam Connections, Beam to Column Connection and Column Splices [No Numerical Problems]	08 Hours L1, L2, L3, L5
Course Outcomes: After studying this course, students will be able to: 1. Possess a knowledge of Steel Structures Advantages and Disadvantages of Steel structures, steel code-IS800:2007 provisions and plastic behaviour of structural steel 2. Understand the Concept of Bolted and Welded connections. 3. Understand the Concept of Design of compression members, built-up columns and columns splices. 4. Understand the Concept of Design of tension members, simple slab base and gusseted base.	
Program Objectives: . Engineering knowledge . Problem analysis . Interpretation of data	
Question Paper Pattern: 1. The question paper will have ten questions. 2. Each full question consists of 20 marks. 3. There will be 2 full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. **5.** The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. N Subramanian., "Design of Steel Structures" (2016), Oxford University Press, New Delhi. 2. Duggal S K., "Limit State Method of Design of Steel Structures", Tata McGraw Hill, New Delhi 3. Bhavikatti.S.S,"Design of Steel Structures" By Limit State Method as per IS:800-2007.	

Reference Books:

1. Dayarathnam P, “Design of Steel Structures”, S Chand and Company Ltd., New Delhi.
2. Kazim S M A and Jindal R S, “Design of Steel Structures”, Prentice Hall of India, New Delhi.
3. IS 800-2007: General Construction in Steel Code Practice (Third revision), Bureau of Indian Standards,
New Delhi.

HYDROLOGY AND IRRIGATION ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER –VI

SubjectCode	21CV62	CIE	50
NumberofLectureHour/Week	2L+1T	SEE	50
Total Number of Lecture Hours	42	Exam Hours	03
CREDITS – 03			

Course Objectives: This course will enable students to

1. Understand the concept of hydrology and components of hydrologic cycle such as precipitation, infiltration, evaporation, and transpiration.
2. Quantify of runoff and use the concept of unit hydrograph.
3. Demonstrate different methods of irrigation, methods of application of water and irrigation procedure.
4. Design canals and canal network based on the water requirement of various crops.
5. Determine the reservoir capacity.

CO#	Course Outcomes	POs	PSOs
CO1	Understand the importance of hydrology and its components.		
CO2	Measure precipitation and analyze the data and analyze the losses in precipitation.		
CO3	Estimate runoff and develop unit hydrographs.		
CO4	Calculate the quantity of irrigation water and frequency of irrigation for various crops.		
CO5	Calculate the canal capacity, design the canal and compute the reservoir capacity.		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1	√	√				
CO2		√		√		
CO3		√	√	√		
CO4		√	√	√		
CO5		√	√	√		

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2					2	2					1			
CO2	2	2	2	2	1	2	2	1	1					1	
CO3	2	2	2	2	1	2	2	1	1					2	
CO4	2	2	2	2	1	2	1		1		2	2	2		2
CO5	2	2	2	2	1	2	1		1		2	2	2		2

Modules	**Teaching**	**RBT**

	Hours	Level
Module -1		
Hydrology: Introduction, Importance of hydrology, Global distribution of water and Indian water availability, Practical application of hydrology, Hydrologic cycle (Horton's) qualitative and engineering representation. **Precipitation:** Definition, Forms and types of precipitation, measurement of rain fall using Symon's and Syphon type of rain gauges, optimum number of rain gauge stations, consistency of rainfall data (double mass curve method), computation of mean rainfall, estimation of missing data, presentation of precipitation data, moving average curve, mass curve, rainfall hyetographs.	08	L1, L2
Module -2		
losses: Evaporation: Introduction, Process, factors affecting evaporation, measurement using IS class-A Pan, estimation using empirical formulae (Meyer's and Rohwer's equations) Reservoir evaporation and control. **Evapo-transpiration:** Introduction, Consumptive use, AET, PET, Factors affecting, Measurement, Estimation by Blaney-Criddle equation. **Infiltration:** Introduction, factors affecting infiltration capacity, measurement by double ring infiltrometer, Horton's infiltration equation, infiltration indices.	10	L2, L4
Module -3		
Runoff: Definition, concept of catchment, factors affecting runoff, rainfall – runoff relationship using regression analysis. **Hydrographs:** Definition, components of hydrograph, base flow separation, unit hydrograph, assumption, application and limitations, derivation from simple storm hydrographs, S curve and its computations, Conversion of UH of different durations.	08	L2, L4
Module -4		
Irrigation: Definition. Benefits and ill effects of irrigation. System of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation. **Water Requirements of Crops:** Duty, delta and base period, relationship between them, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation (Numericals).	08	L2, L4
Module -5		
Canals: Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals. Standard sections. Design of canals by Lacey's and Kennedy's method. **Reservoirs:** Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.	08	L2, L4

Course outcomes: After studying this course, students will be able to:

1. Understand the importance of hydrology and its components.
2. Measure precipitation and analyze the data and analyze the losses in precipitation.
3. Estimate runoff and develop unit hydrographs.
4. Calculate the quantity of irrigation water and frequency of irrigation for various crops.
5. Calculate the canal capacity, design the canal and compute the reservoir capacity.

Question paper pattern:

1. The question paper will have ten full questions carrying equal marks.
2. Each full question will be for 20 marks.
3. There will be two full questions (with a maximum of four sub- questions) from each module.
4. Each full question will have sub- question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. K. Subramanya, "Engineering Hydrology", Tata McGraw Hill Publishers, New Delhi.
2. Jayarami Reddy, "A Text Book of Hydrology", Lakshmi Publications, New Delhi.
3. Punmia and LalPandey, "Irrigation and Water Power Engineering" Lakshmi Publications, New Delhi.

Reference Books:

1. H.M. Raghunath, "Hydrology", Wiley Eastern Publication, New Delhi.
2. Sharma R.K., "Irrigation Engineering and Hydraulics", Oxford & IBH Publishing Co., New Delhi.

Environmental Engineering

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – VI

Subject Code	21CV631	**CIE**	50
NumberofLectureHour/Week	3L	**SEE**	50
Total Number of Lecture Hours	42	**Exam Hours**	03

CREDITS – 03

Course objectives: This course will enable studentsto

1. Understand the Environmental pollution Caused by Human Activities
2. To enable the student to understand source, collection and convey of water.
3. Quality of water and its permissible standards.
4. To know the Methods to treat the water physical, chemical and biological.
5. Understand different method of water treatment

Course Outcomes(COs):

On completion of this course, the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	The population forecasting		
CO2	Students Able to understand Conveyance of water through pipes and pumps		
CO3	BIS Standard for drinking water		
CO4	Design of filter beds. With different media		
CO5	Understands the concepts and application of methods and disinfection.		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1			√	√		
CO2	√	√	√			
CO3			√	√		
CO4					√	√
CO5		√	√			

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2									2	3	1	
CO2	2	2	2				2					2	2	1	2
CO3	2	2	2									2	2	2	1
CO4	3	2	2				2					2	3	3	2
CO5	3	2	2				2	2				2	3	3	2

MODULES	Teaching Hours	RBT Level
Module -1		
INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected watersupply**.** DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water, design periods & factors governing the design periods, numericals on population forecasting.	**8 Hours**	**L3,L4**
Module -2		
SOURCES: Surface and subsurface sources – suitability withregard to quality andquantity. COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Numerical on pumps.	**8 Hours**	**L1, L2,L3**
Module -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. Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.	**8 Hour**	**L3,L4**
Module -4		
WATER TREATMENT: Objectives – Treatment flow-chart. Aeration- Principles, types of Aerators. SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari- flocculator. FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters. Numerical on the filtration, sedimentation.	**10 Hours**	**L5, L6**
Module -5		
DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV radiation treatment – treatment of swimming pool Water. FLOURIDATION AND DEFLOURADATION SOFTENING – definition, methods of removal of hardness by lime	**08 hours**	**L2, L3**

soda process and zeolite process RO & Membrane technique.		

Question paper pattern:

- The question paper will have tenquestions.
- Each full question consists of 10marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under amodule.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. 1. Water supply Engineering –S.K.Garg, KhannaPublishers
2. Environmental Engineering I –B C Punima and AshokJain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, NewDelhi.

Sustainability concepts in Engineering

B.E., VI Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

SubjectCode	21CV632	**CIE**	50
NumberofLectureHour/Week	3L	**SEE**	50
Total Number of Lecture Hours	42	**Exam Hours**	03

CREDITS – 03

Course Objectives: The objective of this course is to make students to learn:

1. To have an increased awareness among students on issues in areas of sustainability.
2. To understand the role of engineering and technology within sustainable development.
3. To know the methods,too;s and incentives for sustainable product service system development.
4. To establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental,societal and economic problems.

Course Outcomes(COs):

After a successful completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction.		
CO2	Explain the different types of environmental pollution problems and their sustainable solutions .		
CO3	Discuss the environmental regulations and standards.		
CO4	Outline the concepts related to conventional and non-conventional energy.		
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles.		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1	√	√	√			
CO2	√	√	√			
CO3		√	√	√		
CO4	√	√	√	√		
CO5	√	√	√	√		

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3		2	1				2	1			2	3		
CO2	3		3	1	1	2	3	2	1			2	3		
CO3	3		3		3	2	3	2	1			3	3		
CO4	3		3	2	2	2	2	2	1			3	3		
CO5	3		3	2	2	2	2	2	1			2	3		
Note: 1-Low, 2-Medium, 3-High															

Modules	Teaching Hours	RBT Level
Module -1		
Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).	**9 Hours**	**L1,L2,L3**
Module -2		
Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.	**9 Hours**	**L1,L2,L3**
Module -3		
Environmental management standards: ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.	**8 Hours**	**L2,L3,L4**
Module -4		
Resources and its utilization: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.	**8 Hours**	**L1,L2,L3,L4**
Module -5		
Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanization, Sustainable cities, Sustainable transport.	**8 Hours**	**L1,L2,L3,L4**
Question paper pattern: 1. The question paper will have tenquestions. 2. Each full question consists of 10marks. 3. There will be 2 full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under amodule. The students will have to answer 5 full questions, selecting one full question from each module.		

Reference Books:

1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
4. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
5. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
6. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

HIGHWAY ENGINEERING [As per Choice Based Credit System (CBCS) scheme] SEMESTER –VI			
Subject Code	21CV641	IA Marks	50
Number of Lecture Hours/Week	03	Exam Marks	50
Total Number of Lecture Hours	42 Hours	Exam Hours	03
		Total Marks-100	

CREDITS – 03

Course objectives:

1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of requireddata.
2. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavementconstruction.
3. Design road geometrics, structural components of pavement anddrainage.
4. Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financingconcepts.
5. Failure and remedial measure in flexible and rigid pavement.

Course Outcomes (COs):

*On completion of this course,*the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	Gain knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same inINDIA.		
CO2	Understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economicimpact).		
CO3	Get insight to different aspects of geometric elements and train them to design geometric elements of a highwaynetwork.		
CO4	Understand pavement and its components, pavement construction activities and itsrequirements.		
CO5	Gaintheskillsofevaluatingthehighwayeconomics and pavement failure and remedial measures		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2	√	√		√	√	
CO3		√	√	√	√	
CO4		√	√	√		
CO5	√	√	√	√	√	

Course Articulation Matrix / Course mapping:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	1	2				2	2		2	3	3			
CO2	2	1	3				2	2		2	3	3			
CO3	1	2	2			1	1	1		2	3	3			
CO4	2	2	3				2	2		2	3	2			
CO5	2	2	2				1	2	2	3	3	3			

Module -1	**Teaching Hours**	**RBT Level**
Principles of Transportation Engineering: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute **Highway Development and Planning:** Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing, problems on best alignment among alternate proposals Salient Features of 3rd and 4thtwenty year road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and Karnataka (KSHIP & KRDCL) Road development plan - vision 2021 and 2025 numerical Problems.	**08 HOURS**	**L1,L2, L3**
Module -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:** Cross sectional elements–width, surface, camber, Sight distances–SSD, OSD, ISD, HSD, Design of horizontal and vertical alignment–curves, super-elevation, widening, gradients, summit and valley curves, numerical Problems.	**12 HOURS**	**L2,L3, L4**
Module -3		
Pavement Materials: Subgrade soil - desirable properties-HRB and IS soil classification- determination of CBR and modulus of subgrade reaction with Problems Aggregates- Desirable properties and tests, Bituminous Materials-Explanation on Tar, bitumen, cutback and emulsion-tests on bituminous material and mix design – Marshall Method, numerical Problems. **Pavement Design:** Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical methodonly)-Examples	**08 HOURS**	**L2,L3, L4**
Module -4		
Pavement Construction: Earthwork; cutting and Filling, Preparation of subgrade, Specification and construction of i) Granular Sub base, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v)Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads	**06 HOURS**	**L2,L3**

Module -5		
Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location, numerical Problems. **Highway Economics and Failure in Pavement:** Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method, BOT-BOOT concepts. Important failure in flexible and rigid pavement and their remedial measures, numerical Problems.	**08 HOURS**	**L1,L2,L3**
Program Objectives: • Engineeringknowledge • Problemanalysis • Interpretation ofdata		
TextBooks: 1. S K Khanna and C E G Justo, " Highway Engineering", Nem Chand Bros,Roorkee 2. L R Kadiyali, "Highway Engineering", Khanna Publishers, NewDelhi. 3. R Srinivasa Kumar, "Highway Engineering", UniversityPress. 4. K.P.subramanium, "Transportation Engineering", SciTech Publications,Chennai.		
Reference Books: 1. Relevant IRCCodes 2. Specifications for Roads and Bridges-MoRT&H, IRC, NewDelhi. 3. C. JotinKhisty, B. Kentlal, "Transportation Engineering", PHI Learning Pvt. Ltd.New Delhi.		

TITLE OF THE COURSE: Ground Improvement Techniques

B.E., VI Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

SubjectCode	21CV642	CIE	50
NumberofLectureHour/Week	3L	SEE	50
Total Number of Lecture Hours	42	Exam Hours	03
CREDITS – 03			

Course Objectives:

This course will enable students to:

1. To impart fundamental knowledge of Ground Improvement Techniques.
2. To make capable of choosing and designing the appropriate method of Ground Improvement according to site conditions and requirement of the project.

Course Outcomes(COs):

After a successful completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Understand the importance of ground improvement techniques in civil engineering construction activities		
CO2	Describe the different techniques of ground improvements		
CO3	Illustrate reinforced wall design using steel strip or geo-reinforcement		
CO4	Perform any modern ground improvement design including soil stabilization		
CO5	Outline the solution for problematic soils		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1	√	√				
CO2		√	√			
CO3	√	√	√			
CO4		√	√			
CO5	√	√	√			

Course Articulation Matrix / Course mapping:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	1									1	1		
CO2	3	2	2	2	1					1		1	1		
CO3	3	2	2	2	1					1		1	1		
CO4	3	2	2	2	1					1		1	1		
CO5	3	2	2	2	1					1		1	1		

Note: 1-Low, 2-Medium, 3-High

Modules	Teaching Hours	RBT Level
Module -1		
Formation and Development of Ground: Introduction, Formation of Rock, soil and soil profile, Soil distribution in India, Alterations of ground after formation, Reclaimed soils, Natural offshore deposits; Ground Improvement Potential – Hazardous ground conditions, poor ground conditions, favourable ground conditions, Alternative Approaches, Geotechnical processes.	**08** HRS	L1, L2,
Module -2		
Drainage Methods: Introduction, Seepage, filter requirements, ground water and seepage control, methods of dewatering systems, Design of dewatering system including pipe line effects of dewatering. Drains, different types of drains.	**08** HRS	L2,L3
Module -3		
Chemical Modification: Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash.	**08** HRS	L1,L2, L3
Module -4		
Vibration Methods: Introduction, Vibro compaction – blasting, vibratory probe, Vibro displacement compaction – displacement piles, vibro flotation, sand compaction piles, stone columns, heavy tamping **Grouting And Injection:** Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.	**08** HRS	L2,L3
Module -5		
Geosynthetics: Introduction, Geosynthetic types, properties of Geosynthetics – materials and fibre properties, Geometrical aspects, mechanical properties, Hydraulic properties, Durability ; Applications of Geosynthetics - Separation, Filtration and Fluid Transmission, Reinforcement **Miscellaneous Methods (Only Concepts & Uses):** Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micro piles.	**10** HRS	L1,L2, L3,
Question paper pattern: 1. The question paper will have tenquestions. 2. Each full question consists of 10marks. 3. There will be 2 full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under amodule. The students will have to answer 5 full questions, selecting one full question from each module.		
CIE + Assignments: 15+35=50 Marks **There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be 35 marks for Assignments.**		
Text Books: 1. Purushothama Raj P, "Ground Improvement Techniques", Laxmi Publications, New Delhi. 2. Koerner R.M, "Construction and Geotechnical Method in Foundation Engineering", McGraw Hill Pub. Co.		

Reference Books:

1. Bell, F.G., “Methods of treatment of unstable ground”, Butterworths, London.

2. Nelson J.D. and Miller D.J, “Expansive soils”, John Wiley and Sons.

3. Ingles. C.G. and Metcalf J.B , “Soil Stabilization; Principles and Practice”, Butterworths

4. Manfred Hausmann , “Engineering principles of ground modification”, McGraw Hill Pub. Co.,

SOLID WASTE MANAGEMENT

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

SubjectCode	21CV651	CIE	50
NumberofLectureHour/Week	3L+1T	SEE	50
Total Number of Lecture Hours	52	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable studentsto

1.Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.

2. Knowledge of legal, institutional and financial aspects of management of solid wastes.

3.Become aware of Environment and health impacts of solid waste mismanagement

4: Identifying recycling and reuse options (composting, source separation, and re-use of shredded tires, recycled glass, fly ash, etc.)

5.evaualte different processing methods

.**Course Outcomes(COs):**

On completion of this course,the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	an understanding of the nature and characteristics of municipal solid wastes.		
CO2	Acquire knowledge on the regulatory requirements regarding municipal solid waste management.		
CO3	ability to plan waste minimization and design storage, collection, transport, processing and disposal of municipal solid waste.		
CO4	Identifying (composting, source separation, and re-use of shredded tires, recycled glass, fly ash, etc		
CO5	The students will be able to utilize the waste by material recovery sheet		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1	√	√	√	√		
CO2	√	√	√			
CO3		√	√	√		
CO4		√			√	√
CO5		√	√			

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	2		2		1	2			
CO2	3		2		1		2	2	1			2			
CO3	2	1	2	2		2	3		2		1	2			
CO4	3		2		1		2	2	1		1	2			

CO5	2	1					3		2		1	2			

	Teaching Hours	**RBT Level**
Module -1		
SOURCES AND TYPES 8 Sources and types of municipal solid wastes- waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO's.	12Hours	L1,L2,
Module -2		
ON-SITE STORAGE AND PROCESSING. On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – 3R system	8Hours	L1,L2,
Module -3		
COLLECTION AND TRANSFER 8 Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems resolving	10Hours	L1 L2,L4
Module -4		
OFF-SITE PROCESSING Objectives of waste processing – Physical Processing techniques and Equipment's; Resource recovery from solid waste composting and bio methanation; Thermal processing options – case studies under Indian conditions.	12Hours	L1 L2,
Module -5		
Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation. Dumpsite land reclaim	10Hours	**L1 L2,**

Question paper pattern:

- The question paper will have tenquestions.
- Each full question consists of 10marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under amodule.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., “Unit Operations in Resource Recovery Engineering”, Prentice Hall, Inc., 1981
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000

Reference Books:

1. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001
3. Manser A.G.R. and Keeling A.A.," Practical Handbook of Processing and Recycling of Municipal solid Wastes", Lewis Publishers, CRC Press, 1996
4. George Tchobanoglous and Frank Kreith"Handbook of Solidwaste Management", McGraw Hill, New York, 2002
5.Sasikumar.K, Sanoop Gopi Krishna,"Solid Waste Management", PHI learning, New Delhi,2009

AIR POLLUTION & CONTROL

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

SubjectCode	21CV652	CIE	50
NumberofLectureHour/Week	3L+1T	SEE	50
Total Number of Lecture Hours	52	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable studentsto

1. Study the sources and effects of air pollution.
2. Learn the meteorological factors influencing air pollution.
3. Analyze air pollutant dispersion models.
4. Illustrate particular and gaseous pollution control methods.
5. to improve the knowledge on emerging trends

Course Outcomes(COs):

*On completion of this course,*the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	Identify the major sources of air pollution and understand their effects on healthand environment.		
CO2	Evaluate the dispersion of air pollutants in the atmosphere and to develop airquality models		
CO3	Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.		
CO4	Choose and design control techniques for particulate and gaseous emissions		
CO5	Ability to justify the use of pollution control equipment and there design.		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√	√		
CO2	√	√	√			
CO3		√	√	√		
CO4		√			√	√
CO5		√	√			

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	2	1	1		1	2	1	2	1	1		1	2	1
CO2	2	2	1	1	1	1	2	1	2	1	1		1	1	1
CO3	2	2	1	1	1	1	2	1	1	1	1				
CO4	1	1	1	1		2	2	2	2	1	1		1	1	1

CO5	1	2	1	1		2	2	2	2	1	1		2	1	2

	Teaching Hours	**RBT Level**
Module -1		
Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.	10Hours	L1,L2,L3, L4
Module -2		
Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.	12Hours	L1,L2,L3
Module -3		
Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3)	12Hours	L2,L3,L4
Module -4		
Control Techniques: Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP.	8Hours	L2,L4,L5
Module -5		
Air pollution due to automobiles, standards and control methods. Noise pollution causes, effects and control, noise standards. Environmental issues, global episodes, laws, acts, protocols	10Hours	L2,L3

Question paper pattern:

- The question paper will have tenquestions.
- Each full question consists of 10marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under amodule.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. M. N. Rao and H V N Rao, “Air pollution”, Tata Mc-G raw Hill Publication.
2. H. C. Perkins, “Air pollution”. Tata McGraw Hill Publication
3. Mackenzie Davis and David Cornwell, “Introduction t o Environmental Engineering” McGraw-Hill Co.

Reference Books:

1. Noel De Nevers, “Air Pollution Control Engineering” , Waveland Pr Inc.
2. Anjaneyulu Y, “Text book of Air Pollution and Contr ol Technologies”, Allied Publishers.

EXTENSIVESURVEYLAB

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

SubjectCode	21CVL66	CIE	50
NumberofLectureHour/Week	2P	SEE	50
Total Number of Lecture Hours	28	Exam Hours	03

CREDITS – 01

CourseLearningObjectives: Thiscoursewillenablestudentsto

1. UnderstandthepracticalapplicationsofSurveying.
2. UseTotalstationandotherMeasurementEquipments.
3. Workin teamsand learntimemanagement,communication, andpresentation skills

Course Outcomes(COs):

*On completion of this course,*the student will be able to

CO #	Course Outcomes	POs	PSOs
CO1	Apply surveying knowledge and tools effectively for projects		
CO2	UnderstandingTask environment,goals,Responsibilities,working in teams towards common goals,Organisational proformances expectations,Technical behavioural competencies.		
CO3	Application of individual effectiveness skills in terms and organizational context,Goal setting and time management,communications.		
CO4	Professional etiquettes at workplace,meeting and general		
CO5	Orientation towards conflicts in terms and organizational environment,understanding sources of conflicts,conflicts resolution styles and techniques.		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√	√		√
CO2	√	√	√			√
CO3		√	√	√		√
CO4		√			√	√
CO5		√	√			√

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	2	1	1		1	2	1	2	1	1		1	2	
CO2	2	2	1	1	1	1	2	1	2	1	1		1	1	
CO3	2	2	1	1	1	1	2	1	1	1	1				

CO4	1	1	1	1		2	2	2	2	1	1		1	1		
CO5	1	2	1	1		2	2	2	2	1	1		2	1		

1. **NEWTANK PROJECTS:**Thework shallconsistof;
   a. Reconnaissancesurveyfor selectionof site andconceptualizationofproject.
   b. Alignmentofcenterlineoftheproposedbund,Longitudinalandcrosssectionsofthecenter line.
   c. Detailed surveyrequired for project execution likeCapacity surveys, Details at Wasteweir and sluice points, Canal alignment etc. as per requirement
   d. Design andpreparationofdrawing withreport.
2. **WATERSUPPLYANDSANITARYPROJECT:**Theworkshall consistof;
   a. Reconnaissancesurveyfor selectionofsiteandconceptualizationofproject.
   b. Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population.
   c. Preparationofvillagemapbyusingtotalstation.
   d. Surveyworkrequired forlaying ofwatersupplyandUGD
   e. Locationofsitesforwatertank.Selectionoftypeofwatertanktobeprovided.(groundlevel, overhead and underground)
   f. Designofall elementsandpreparationofdrawingwith report.
3. **HIGHWAYPROJECT:** Theworkshallconsistof;
   a. Reconnaissancesurveyfor selectionof site andconceptualizationofproject.
   b. Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Surveying by using total station.
   c. Report should justify the selected alignment with details of all geometric designs for traffic anddesign speed assumed.
   d. Drawingshallincludekeyplaninitialalignment,finalalignment,longitudinalsectional ongfinal alignment,typicalcrosssectionsofroad.
4. **RESTORATIONOFANEXISTINGTANK:**Theworkshallconsistof;
   a. Reconnaissancesurveyfor selectionofsiteandconceptualizationofproject.
   b. Alignmentofcenterlineoftheexisting bund,Longitudinalandcross sectionsofthecenterline.
   c. Detailed surveyrequired for project execution likeCapacity surveys, Details at Wasteweir and sluice points, Canal alignment etc. as per requirement
   d. Designofall elementsandpreparationofdrawingwith report.
5. **TOWN/HOUSING/ LAYOUTPLANNING:**Thework shallconsistof;
   a. Reconnaissancesurveyfor selectionofsiteandconceptualizationofproject.
   b. Detailedsurveyrequiredforprojectexecutionlikecontoursurveys
   c. Preparationoflayoutplansasper regulations
   e. Centerlinemarking-transferofcentrelinesfrom planto ground
   f. Designof allelementsandpreparationof drawingwithreportasper regulations

Courseoutcomes: Afterstudyingthiscourse,studentswillbeableto:

1. ApplySurveying knowledgeandtoolseffectivelyforthe projects
2. Understanding Task environment, Goals, responsibilities, Task focus, working in Teams towardscommon goals, Organizational performance expectations, technical and behavioral competencies.
3. Applicationofindividualeffectivenessskillsinteamandorganizationalcontext,goalsetting,time management, communication and presentation skills.
4. Professionaletiquettesatworkplace,meetingand general

5. Establishingtrustbasedrelationshipsinteams&organizationalenvironment 6. Orientation towards conflicts in team and organizational environment, Understanding sources ofconflicts, Conflict resolution styles and techniques
ReferenceBooks:
TrainingmanualsandUser manuals Relevantcoursereferencebooks

Software Application Lab [As per Choice Based Credit System (CBCS) scheme] SEMESTER –VI			
Subject Code	21CVL67	CIE	50

NumberofLectureHour/Week	2P	SEE	50
Total Number of Lecture Hours	28	Exam Hours	03

CREDITS – 01

Course objectives:

1. Use industry standard software in a professional set up.
2. understand the elements of finite element modeling, specification of loads and boundary condition, performing
analysis and interpretation of results for final design
3. Develop customized automation tools

Course Outcomes(COs):

*On completion of this course,*the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	To use Analysis software (Civil Engineering)		
CO2	To analyse beams, frames and truss members in software.		
CO3	To Design simple building		
CO4	To use Excel spread sheets in Rcc structures.		
CO5	To use Excel spread sheets in Design of Highway Geometrics		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√	√		
CO2	√	√	√	√		
CO3	√	√	√	√		
CO4	√	√	√	√	√	
CO5	√	√	√	√	√	

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	2	2					1			1			
CO2	3	2	2	2					1			1			
CO3	3	2	2	2					1			1			
CO4	2	2	2	2					1			1			
CO5	2	2	2	2					1			1			

Sl. No	Experiments	Teaching Hours	RBT Levels
1	Analysis of plane trusses, continuous beams using software	28 hrs	L1, L2, L3, L4, L5
2	Analysis of portal frames using software		
3	Rcc design (beam,column)		

4	Importing simple plan from autocad and performing analysis and design of G+1 Building using software		
5	Design of singly reinforced and doubly reinforced rectangular beams		
6	Design of one way and two way slabs		
7	Computation of earthwork,		
8	Design of horizontal curve by offset method,		
9	Design of super elevation Using Excel		
10			

Question paper pattern:

- The question paper will have Four questions (2 questions from analysis and design and other 2 questions from excel spreadsheet).
- Students has to answer 2 questions selecting one question from each part.

REFERENCE BOOKS:

Training manuals and User manuals and Relevant course reference books

ENVIRONMENTAL ENGINEERING LAB **B.E., VI Semester, Civil Engineering** **[As per Choice Based Credit System (CBCS) scheme]**			
Subject code	21CVL68	CIE	50

Number of lecture hours per week	02	SEE	50
Total number of lecture hours	28	Exam hours	03

CREDITS 01

Course Learning Objectives: This course will enable students,

1. To learn different methods of water & waste waterquality
2. To conduct experiments to determine the concentrations of water and wastewater
3. To determine the degree and type oftreatment
4. Tounderstandtheenvironmentalsignificanceandapplicationinenvironmentalengineeringpractice
5. Understanding professional and ethical responsibility

Course Outcomes(COs):

*On completion of this course,*the student will be able to

CO#	Course Outcomes	POs
CO1	Acquirecapabilitytoconductexperimentsandestimatetheconcentrationofdifferentparameters.	
CO2	Compareth eresultwithstandardsanddiscussbasedonthepurposeofanalysis.	
CO3	Determinetypeoftreatment,degreeoftreatmentforwaterandwastewater.	
CO4	Identify the parameter to be analyzed for the student project work in environmentalstream.	
CO5	Compute and visualize the working of various units and write report.	

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√	√	√	
CO2			√	√	√	
CO3			√	√	√	
CO4			√	√	√	
CO5			√	√	√	

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3			2	3	1	2	2		2	1	2	
CO2	3	2	3			2	3	1	2	2		2	1	2	
CO3	3	2	3			2	3	1	2	2		2	1	2	
CO4	3	2	3			2	3	1	2	2		2	1	2	
CO5	3	2	3			2	3	1	2	2		2	1	2	

EXPERIMENTS	Teaching Hours/ RBT LEVEL
1. Preparation chemical reagents required for laboratory analysis by standard method.	**3HR/L3,L4,L5**
2. Determination of pH, Conductivity, TDS and Turbidity.	**3HR/L3,L4,L5**
3. Determination of Acidity and Alkalinity	**3HR/L3,L4,L5**

4. Determination of Calcium, Magnesium and Total Hardness.	**3HR/L3,L4,L5**
5. Determination of Dissolved Oxygen	**3HR/L3,L4,L5**
6. Determination of BOD.	**3HR/L3,L4,L5**
7. Determination of Chlorides	**3HR/L3,L4,L5**
8. Determination of percentage of % of available chlorine in bleaching powder sample, Determination of Residual Chlorine and chlorine demand.	**3HR/L3,L4,L5**
9. Determination of Solids in Sewage: i) Total Solids, ii) Suspended Solids, iii) Dissolved Solids.	**3HR/L3,L4,L5**
10. Determination of optimum coagulant dosage using Jar test apparatus.	**3HR/L3,L4,L5**
11. Determination of Fluoride, Nitrate and Sulphate by spectrophotometer	**3HR/L3,L4,L5**
12. Determination of COD(Demonstration)	**3HR/L3,L4,L5**
13. Air Quality Monitoring (Demonstration)	**3HR/L3,L4,L5**

Course Outcomes: After studying this course, students will be able to:

1. Acquirecapabilitytoconductexperimentsandestimatetheconcentrationofdifferentparameters.
2. Comparetheresultwithstandardsanddiscussbasedonthepurposeofanalysis.
3. Determinetypeoftreatment,degreeoftreatmentforwaterandwastewater.
4. Identify the parameter to be analyzed for the student project work in environmentalstream.

Question paper pattern:

Two experiments shall be asked from the above set ofexperiments.
Oneexperimenttobeconductedandfortheotherstudentshouldwritedetailedprocedure.

References

1. IS codes-3025series
2. Standard method for examination of water and waste water, APHA, 20th edition

ClairSawyerandPerryMcCartyandGeneParkin,"ChemistryforEnvironmentalEngineeringand Science", McGraw-Series in Civil and EnvironmentalEngineering.

PROFESSIONAL ETHICS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
SEMESTER-VI

Subject Code	21HSM69	Cie Marks	50
Number of Lecture Hour/Week	1L	SEE Marks	50
Total Number of Lecture Hours	20	Exam Hours	03

CREDITS-01

Course Objectives:

1. To enable the students to create an awareness on Engineering Ethics and Human Values,
2. To instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Module -1	**Teaching Hours**
HUMAN VALUES Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management	04 Hours
Module -2	
ENGINEERING ETHICS Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories	04 Hours
Module -3	
ENGINEERING AS SOCIAL EXPERIMENTATION Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.	04 Hours
Module -4	
SAFETY, RESPONSIBILITIES AND RIGHTS Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination	04 Hours
Module -5	
GLOBAL ISSUES Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility	04 Hours

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

CO-1-Understand the human values required to live peaceful in the society.
CO-2-Apply ethics in society, discuss the ethical issues related to engineering
CO-3-Realize the responsibilities and rights of an engineer in the society
CO-4-Understand the role and responsibility of an engineer in maintaining the safety of society.
CO-5-Understand the global issues related to product development.

Text Books:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

ference Books:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi 2013.
6. World Community Service Centre, " Value Education", Vethathiri publications, Erode, 2011

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):

Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2
CO1	-	-	-	-	-	3	-		-	-	-	2	-	-
CO2	3	-	-	-	-	3	-	3	-	-	-	2	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	2	-	-

PROJECT-VI [As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-VI			
Subject Code	21PRJ69	CIE Marks	50
Number Lecture Hour/Week	2P	SEE Marks	50
Total Number of Lecture Hours	24	Exam Hours	03
CREDITS-01			

Course Objectives: Students will be taught to:

1. Get exposure about the civil engineering coursework to solve real-world problems.
2. Design the working model of the open ended problem.
3. Understand concepts of safety durability and environmental impacts.
4. Understand the latest technology and software tools.
5. Prepare technical documentation of the project.

STUDENTS WILL BE GIVEN A OPEN ENDED PROBLEM OF THE SOCIETY AND ASKED TO SOLVE BY DESIGNING AND IMPLEMENTING THE SYSTEM IN TEAM.

Course outcomes: After studying this course, students will be able to:

CO1. Apply the knowledge of civil engineering and to solve the real time problems of the society.
CO2. Analyze the various existing solutions available to solve the real time problem and propose the best solution.
CO3. Design and implement the system to solve the real time problem of the society.
CO4. Conduct investigations on the output and prepare the technical documentation of the designed system in a team.
CO5. Use the modern tool available like advanced software tools.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	**PO.1**	**PO.2**	**PO.3**	**PO.4**	**PO.5**	**PO.6**	**PO.7**	**PO.8**	**PO.9**	**PO.10**	**PO.11**	**PO.12**	**PSO.1**	**PSO.2**
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO2	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO3	**-**	**-**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO4	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

Construction Project Management using Primavera P-6

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER –VI

Subject Code	21ACV6101	**CIE**	50
Number ofLecture Hours/Week	01	**SEE**	50
Total Number ofLecture Hours	16	**Exam Hours**	03

CREDITS – 01

Course objectives:

1. Use industry standard software in a professional set up.
2. understand the fundamentals of project management.
3. Develop/ generating report.

Course Outcomes(COs):

*On completion of this course,*the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	Understand data structures & create a project		
CO2	Create OBS, WBS		
CO3	Add activities & create relationships View calendars & schedule project		
CO4	Format schedule data ,Define & assign roles and resources		
CO5	Optimize the project plan and Execute the project		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	**Understand (L2)**	**Apply (L3)**	**Analyze (L4)**	**Evaluate (L5)**	**Create (L6)**
CO1	√	√	√	√		
CO2	√	√	√	√		
CO3	√	√	√	√		
CO4	√	√	√	√	√	
CO5	√	√	√	√	√	

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	2	2					1			1		3	
CO2	3	2	2	2					1			1		3	
CO3	3	2	2	2					1			1		3	
CO4	2	2	2	2					1			1		3	
CO5	2	2	2	2					1			1		3	

Sl. No	Experiments	Teaching	RBT Levels

		Hours	
1	Introduction to Project Management • Basics of project management • Importance of project management software like Primavera	16 hrs	L1, L2, L3, L4, L5
2	. Introduction to Primavera • Navigation of the Primavera P6 interface • Features and capabilities		
3	Creating of Project • Setting up a new project • Defining Project details (start date, end date, etc.) • Organizing project structures (Work Breakdown Structure - WBS)		
4	Adding Activities • Adding activities manually • Assigning roles to activities • Establishing relation between activities		
5	Planning and Scheduling • Scheduling Types, Progress Override, Scheduling Logs • Assigning durations to activities • Applying Constraints and deadlines		
6	Project Resource management • Types of Resources (labor, equipment, materials) • Adding and organizing Resources		
7	Reports Creation • Generating basic reports • Global Reports, Weekly Report, Project closing report • Customizing reports to meet project requirements		

Continuous Internal Evaluation (CIE):

The split-up of CIE marks for record/ journal and test are in the ratio 70:30

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments Total marks scored by the students are scaled down to 35 marks (70% of maximum marks).
- Department shall conduct a test after the completion of all the experiments listed in the syllabus for 15 marks.

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- Instructions as printed on the cover page of answer script for split up of marks is to be followed

REFERENCE BOOKS:

Training manuals and User manuals and Relevant course reference books

Quantity Estimation

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code: 21ACV6102	CIE	50
Number ofLecture Hours/Week: 1	SEE	50
Total Number ofLecture Hours: 16	Exam Hours	03

CREDITS – 01

Course objectives:

1.Estimate the quantities of work,

2.To develop the bill of quantities and arrive at the Cost of civil engineering Project

3.Estimate the quantities of sub-structure elements

4. Estimate the quantities of sub-structure elements

5. Estimate the quantities of steel in RCC

Course Outcomes (COs):

On completion of this course,the student will be able to

CO#	Course Outcomes	POs	PSOs
CO1	Enterpret the construction drawings and prepare quantity estimates		
CO2	Prepare quantity estimate for substructure elements		
CO3	Prepare quantity estimate for superstructure elements		
CO4	Prepare quantity estimate for Reinforcement in RCC		
CO5	Prepare bill of quantities		

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√			
CO2		√	√	√		
CO3		√	√	√		
CO4		√	√	√		
CO5		√	√	√		

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	2	1							1	1	3	2	
CO2	2	2	2	1	1						1	1	3	2	
CO3	2	2	2	1	1						1	1	3	2	
CO4	2	2	2	1	1						1	1	3	2	
CO5	2	2	2	1	1						1	1	3	2	

Modules	Teaching Hours	RBT Level
Module -1		
Sub structure calculation items to be calculated below Ground level 1. P.C.C for footings 2. Footings 3. Plinth beams or Ground beams 4. Ground level slab 5. Earth work Excavation calculation 6. Back- Fill calculation 7. Abstract for the Quantities of Sub-structure. 8. Bill of Quantities	**06 Hours**	**L1,L2,L4**
Module -2		
Superstructure calculation items to be calculated above Ground level 1. Floor columns 2. Floor beams 3. Floor slabs 4. Stair cases (Typical & Semi-Circular) 5. Brick work (No. of bricks required) 6. Cement: Mortar required for brick work 7. Flooring Calculations (Vitrified tiles, Parking Tiles & Inter-lock Tiles) 8. Wall Tiles (Ceramic Tiles) calculations 9. Wood calculations for doors & window 10. Abstract for the quantities of super structure 11. Bill of Quantities for Super structure	**05 Hours**	**L2,L3,L4**
Module -3		
Reinforcement calculations for footing , plinth beam ,column , roof beam , slab	**05 Hours**	**L4**

Question paper pattern:

- The question paper will having **two questions** , 1st question from module 1 & 2 & 2nd question will be from module 3
- 1st from module 1 & 2 carries 20 marks & 2nd question from module 3 carries 30 marks.

TEXT BOOK:

1. Datta B.N., "Estimating and costing", UBSPD Publishing House, New Delhi
2. B.S. Patil, " Civil Engineering Contracts and Estimates", Universities Press
3. M. Chakraborthi; "Estimation, Costing and Specifications", Laxmi Publications
4. MORTH Specification for Roads and Bridge Works – IRC New Delhi
5. H.S.Vishwanth., "Estimation and valuation", Sapna publications, Bangalore