DESIGN OF STEEL STRUCTURES

B.TECH., VI Semester, Civil Engineering

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

Subject Code	22CV61	CIE	50
Number of Lecture Hour/Week	3L	SEE	50
Total Number of Lecture Hours	42	Exam Hours	03
	CREDIT	<u>-03</u>	

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 the analysis and design of 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. Behavior & Design of beam section.

CO#	Course Outcomes
CO1	Possess a knowledge of Steel Structures Advantages and Disadvantages of Steel
COI	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
005	columns splices.
CO4	Understand the Concept of Design of tension members, simple slab base and gusseted
004	base.
CO5	Understand the Concept of Behavior & Design of beams.

Modules	Teaching Hours
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
 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. Welded Connections: Introduction, Types and properties of welds, Weld Defects, Simple welded joints for truss member, Advantages and Disadvantages. Numerical 	10 Hours
Module -3 Design of Beams: Introduction, Types of beams, Lateral stability of beams, Factors affecting lateral stability -Behavior of Beams in flexure, Beam types Beam to Beam Connections, Beam to Column Connection and Column Splices [No Numerical Problems]	08 Hours

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Mod	ule -4		D	D	•	с д .	1 01	1 D			(1 D					
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Desig	n or 1	ensio	n Me		S: Inu foilura		.1011, I	ypes		ension	ffooti	bers, 1	strong	or of		
topoic		hore	, mou Docia	es of T			borg	ss rau	ю, га	ctors a		Num	streng	gin of		
Mod	Module -5															
Desig	Design of Compression Members: Introduction, Sections used for compression															
meml	members, Behavior & types of failures, Effective length of compression members, Design 08 Hours														Hours	
of co	mpressi	on m	ember	s s	ianu	C3, L1		e ieng		compre	2551011	menne	C15, D	csign		
Desig	n of La	iced a	nd Ba	ittened	Syste	ems. N	Iumeri	ical								
Cour	se Out	come	s: Aft	er stud	lving t	his co	urse.	studer	nts wi	ll be al	ble to:					
1. Po	1. Possess a knowledge of Steel Structures Advantages and Disadvantages of Steel structures, steel															
code-IS800:2007																
provi	sions ar	nd pla	stic b	ehavio	r of st	ructu	al stee	el								
2. Un	derstan	d the	Conce	ept of	Bolted	and '	Welde	d con	nectio	ons.						
3. Un	derstan	d the	Conce	ept of	Desig	n of c	ompre	ssion	meml	bers, bi	uilt-up	o colui	nns ar	nd colu	imns s	splices.
4. Un	derstan	d the	Conce	ept of	Desig	n of te	ension	mem	bers, s	simple	slab b	ase ar	nd gus	seted h	base.	1
Prog	Program Objectives:															
. Eng	ineering	g kno	wledg	e												
. Prot	olem an	alysis	3													
. Inter	rpretatio	onof	data													
Oues	tion Pa	ner I	Patter	n:												
1.	The c	uesti	on pai	ber wil	ll have	e ten o	uestio	ons.								
2	Each	full c	mestic	n con	sists o	f 20 n	narks									
2.	Thore	s will	$b_0 2 f$	full au	oction	a (wit	h a ma	vimu	moft	four su	h aug	stions)	from	oach r	nodul	9
J.	Each	5 WIII 6.11 c			hove	s (with	n a ma			oll the	u que:	aunda		each i	nouui	c .
4.	Each		luestic		nave	sub q			ering	an the	topic			saule.		1 1
5.	The s	tuder	nts wil	I have	to and	swer 5	full q	luestic	ons, se	electing	g one	full qu	lestion	from	each	module.
Text	Books:		(()		6.04	1.04		. (001	$\alpha \alpha$	C 1 T	т •	·/ D	``		11 •	
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J. IS Stand	000-20 ards	07. U	chera	COIIS	ucuc	n m s		Jule r	Tactic	e (1111	luiev	151011),	Duica	au 01 1	nutan	
New	Delhi															
	urse A	rticu	lation	Matr	ix / C	niirse	mann	ning.								
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	CO#	POI	P02	PO3	P04	POS	PO6	P07	POS	P09	P10	P11	P12	PSO	PSO	DSO

CO1

CO2

CO3

CO4

CO5

HYDROLOGY AND IRRIGATION ENGINEERING B.TECH., VI Semester, Civil Engineering

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

Subject Code	22CV62	CIE	50
Number of Lecture Hours/Week	03	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
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.

Modules	Teaching Hours
Module -1	
Hydrology:	
Introduction, Importance of hydrology, Global distribution of water and Indian water	
availability, Practical application of hydrology, Hydrologic cycle (Horton's)	08 hours
qualitative and engineering representation. Vertical Structure of the atmosphere.	
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 rainfall hydrographs	
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:	08 Hours
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.	
Module -3	
Runoff:	
Definition, concept of catchment, factors affecting runoff, rainfall – runoff	
relationship using regression analysis.	00.11
Hydrographs:	08 Hours
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.	
Module -4	
Irrigation:	
Definition. Benefits and ill effects of irrigation, System of irrigation: surface and	
ground water, flow irrigation, lift irrigation, Bandhara irrigation. Methods of water	
distribution to crops.	10 Hours
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).	
Module -5	
Canals:	
Classification of canals, distribution system for canal irrigation. 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	08 Hours
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.	

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.

4. Santosh Kumar Garg, "Irrigation Engineering and Hydraulic Structures", Khanna 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.

Course Articulation Matrix / Course mapping :

CO#	P01	P02	P03	PO4	PO5	PO6	P07	P08	P09	P10	P11	P12	PS01	PSO2	PSO3
CO1	2					2	2					1		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		
CO5	2	2	2	2	1	2	1		1		2	2	2		

Env	vironmental Engineer	ring								
B.TECH.	, VI Semester, Civil Eng	ineering Based Credit System(C	BCS) Schomol							
[As per NEP, Outcome based eut		e based credit system(c	bcs/schemej							
Subject Code	22CV631	CIE	50							
Number of Lecture Hour/Week3LSEE										
Total Number of Lecture Hours	03									
Course objectives: This course will ena 1. Understand the Environ 2. To enable the student to 3. Quality of water and its 4. To know the Methods to 5. Understand different me	able students to imental pollution Caus o understand source, co permissible standards o treat the water phys ethod of water treatme	ed by Human Activitie ollection and convey of a. sical, chemical and bio ent	es Twater. logical.							
	MODULES		Teaching Hours							
Module -1										
DEMAND OF WATER: Types of water institutional and commercial, public uses factors affecting per capita demand, popu merits & demerits- variations in demand of the design periods, numericals on population	er demands- domestic of s, fire demand. Per capital function forecasting, differ f water, design periods & ion forecasting.	demand in detail, ita consumption – rent methods with a factors governing	8 Hours							
SOLIDCES, Surface and subsurface course	ag guitability with raga	rd to quality and								
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. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Numerical on pumps.										
	Module -3									
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.										
	Module -4									
WATER TREATMENT: Objectives – T types of Aerators. SEDIMENTATION: Theory, settling	reatment flow-chart. Action tanks, types, design.	eration- Principles, Coagulant aided								

sedi	mentation,	jar test, chemical feeding, flash mixing, and clari- flocculator.								
FILT	FRATION:	Mechanism - theory of filtration, types of filters, slow sand, rapid sand	10 Hours							
and	nd pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in									
excl	uding unde	er drainage system – back washing of filters. Operational problems in								
filte	rs.									
Nun	nerical on t	he filtration, sedimentation.								
		Module -5								
DIS	SINFECTI	ON: Theory of disinfection, types of disinfection, Chlorination,								
chl	orine dema	and, residual chlorine, use of bleaching powder. UV radiation treatment	08 hours							
-tr	eatment of	Swimming pool Water.								
FL	OURIDAT	ION AND DEFLOURADATION								
SO	FTENING	– definition, methods of removal of hardness by lime soda process								
and	l zeolite pr	ocess RO & Membrane technique. Methods of Distribution system,								
Co	mponents o	of Distribution system, Layouts of Distribution networks								
Cou	rse Outco	mes(COs):								
	On comp	letion of this course, the student will be able to								
Г	00//		1							
-	0	Course Outcomes								
	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.								
Qu	estion pap	ber pattern:								
	• The qu	uestion paper will have ten questions.								
	• Each f	full question consists of 10 marks.								
	• There	will be 2 full questions (with a maximum of four sub questions) from each me	odule.							
	• Each f	full question will have sub questions covering all the topics under a module.								
	• The st	udents will have to answer 5 full questions, selecting one full question from e	ach module.							
Tex	xt Books:									
1.	1. Water s	supply Engineering –S.K.Garg, Khanna Publishers								
2.	Environm	ental Engineering I –B C Punima and Ashok Jain								
3.	Manual or	n Water supply and treatment –CPHEEO, Minstry of Urban								
	Developm	nent, New Delhi.								
	C	Autionation Matuin / Common manning -								
	Vourse	Articulation Matrix / Course mapping :								

Note: 1-Low, 2-Meeting, 5-mgn															
CO#	P01	P02	P03	P04	P05	P06	P07	PO8	P09	P10	P11	P12	PS01	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

REPAIRS, REHABILIT	ATION AND RETRO	DFITTING OF			
STI	RUCTURES				
B.TECH., VI	Semester, Civil Engine	ering			
[As per NEP, Outcome Based Education	[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]				
Subject Code	22CV632	CIE	50		
Number of Lecture/Hours/Weeks 3L SEE					
Total Number of	42	Exam Hours	03		
Lecture Hours					
	CREDITS – 03				
1.To learn various distress and damages to concre 2.To understand the importance of maintenance of 3. To study the various types and properties of re 4.To assess the damage to structures using variou 5.To learn the importance and methods of substra	ents to ete and masonry structu of structures pair materials is tests ate preparation	ires			
			Teaching		
Mod	lules		Hours		
	Module -1				
INTRODUCTION: An overview of present rep	pair practices, distress	identification and repair			
management, Causes of distress in concrete s concrete, Permeability of concrete, aggressive SurveyDefinition, objectives, different stages-I inspection, field laboratory testing stage, consider	structures-Holistic Mo chemical agents, dura Preliminary inspection ration for repair strateg	dels for deterioration of bility aspects, Condition , planning stage, visual y	09 Hours		
	Module -2				
NON DESTRUCTIVE AND DESTRUCTIVE evaluation tests - Concrete strength assessment - I tests, penetration resistance, pull out tests, core sa tests and chloride content, Corrosion potential as measurement, Identification and estimation of da	/E TESTING METH Rebound hammer test - mpling and testing, Che sessment, half cell pote mage.	HODS: Non-Destructive Ultrasonic pulse velocity emical tests - Carbonation entiometer test, resistivity	08 Hours		
	Module -3				
EVALUATION OF STRUCTURAL PROPERTI and soundness assessment, interpretation and eva of existing structures, analysis necessary to iden modeling of repaired composite structures	IES: Fire damage assess luation of results, Eval tify critical sections, a	sment, structural integrity uation of reserve strength ctive and passive repairs,	08 Hours		
	Module -4				
REPAIR MATERIALS AND CASE STUDIE Essential parameters for repair materials-Streng aspects, Materials for repair. Discussion of case structures-Identifying a suitable repair option for	S: Selection of repair gth and durability asp studies- RCC building certain damage in a str	materials for concrete- ects, cost and suitability s, water tanks, industrial ucture.	08 Hours		
	Module -5				

REPAIR/ REHABILITATION METHODS AND STRATEGIES: Rehabilitation and retrofitting methods-repair options, performance requirements of repair systems, factors for selection of repair methods, Repair stages, Methods of repair including foundation rehabilitation methods, chemical and electrochemical method. Repair/Rehabilitation strategies - Stress reduction technique, repair and strengthening of columns and beams, Compressive strength of concrete, cracks/joints, masonry, foundation, base isolation.

Course outcomes: On the completion of this course students are able to attain the following outcomes;

- 1. Various distress and damages to concrete and masonry structures
- 2. The importance of maintenance of structures, types and properties of repair materials etc
- 3. Assessing damage to structures and various repair techniques
- 4. Select Repair Material & identify a suitable repair option.
- 5. Evaluate structural properties.

Question paper pattern:

- 1. The question paper will have ten questions.
- 2. Each full question consists of 10 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. Varghese P.C., "Maintenance, Repair & Rehabilitation And Minor Works of Buildings" 1st Edition, PHI Learning Private Ltd., New Delhi., 2014.

- 2. Santhakumar A.R., "Concrete Technology" Oxford University Press, 2007, New Delhi
- 3. CPWD Handbook on Repair and Rehabilitation of RCC buildings, Govt. of India Press, New Delhi.
- 4. Raikar, R.N., "Learning from failures Deficiencies in Design, Construction and Service" R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.

Reference Books:

1. Shetty, M.S; Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.

2. Vidivelli, B; Rehabilitation of Concrete Structures, Standard Publishers Distributors, New Delhi, 2008

3. P.K.Guha, Maintenance and Repairs of Buildings, New Central Book Agency (P) Ltd, Kolkata.

Course Articulation Matrix / Course mapping: Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	P04	PO5	PO6	PO7	PO8	60d	P10	P11	P12	PSO1	PSO2	PSO3
CO1		2	2	2	2					1		1		3	2
CO2		2	2	2	1					1		1		2	3
CO3		2	2	2	1					1		1		2	3
CO4		2	2	2	1					1		1		2	3
CO5		2	2	2	1					1		1		2	3

HIGHWAY ENGINEERING

B.TECH., VI Semester, Civil Engineering [As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Subject Code	22CV641	CIE	50
Number of Lecture Hours/Week	03	SEE	50
Total Number of Lecture Hours	42 Hours	Exam Hours	03
	CREDITS - 03		

Course objectives:

- 1. Gain knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same in INDIA.
- 2. Understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economic impact).will understand about highway alignment and surveys.
- 3. Get insight to different aspects of geometric elements and train them to design geometric elements of a highway network.
- 4. Understand pavement and its components, pavement construction activities and its requirements.
- 5. Gain the skills of evaluating the highway economics and pavement failure and remedial measures. Gain the importance of highway drainage and will know how to design surface and subsurface drainage.

Module -1	Teaching Hours
 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
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. 	14 HOURS
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 Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples	08 HOURS

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	04 HOURS
Lean Concrete sub base and PQC viii) concrete roads	
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.	08
Highway Economics and Failure in Pavement: Highway user benefits, VOC using charts	HOURS
only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method, BOT-	1100110
BOOT concepts. Important failure in flexible and rigid pavement and their remedial	
measures.	
Course outcomes: After studying this course, students will be able to:	
1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, c necessary field investigation for generation of required data.	conduct
2. Evaluate the engineering properties of the materials and suggest the suitability of the sar	ne for
pavement construction.	
3. Design road geometrics, structural components of pavement and drainage.	
4. Students able to perform the quality test on highway construction materials and contrast	
conventional and modern construction practices.	
5. Evaluate the highway economics by few select methods and also will have a basic knowle	edge of
various highway financing concepts	
Program Objectives:	
Engineering knowledge	
• Problem analysis	
Interpretation of data	
Text Books:	
1. S K Khanna and C E G Justo, "Highway Engineering", Nem Chand Bros, Roorkee	
2. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.	
3. R Srinivasa Kumar, "Highway Engineering", University Press.	
4. K.P.subramanium, "Transportation Engineering", Scillech Publications, Chennal.	
Kelerence Dooks: 1 Delevent IDC Codes	
1. Kelevalli IKU U0008 0. Specifications for Doads and Bridges MoDT & U DC New Dalh:	
2. Specifications for Roads and Druges-Worlden, IRC, New Defin.	
Delhi	
4. Bituminous road construction in India by Prithyi singh Kandhal	
Course Articulation Matrix / Course mapping:	

CO#	P01	P02	PO3	P04	PO5	P06	P07	P08	909	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	1	2				2	2		2	3	3	1	2	
CO2	2	1	3				2	2		2	3	3		1	
CO3	1	2	2			1	1	1		2	3	3			3
CO4	2	2	3				2	2		2	3	2			3
CO5	2	2	2				1	2	2	3	3	3	3		3

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

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Subject Code:	22CV642	CIE	50
Number of Lecture Hours/Week	3L	SEE	50
Total Number of Lecture Hours:	42	Exam Hours	03

CREDITS –03

Course Objectives: This course will enable students to:

1.Understand environmental issues due to building materials and the energy consumption in building materials.

2. Study of various masonry blocks, masonry motor and structural behavior of masonry under compression.

3.Study the alternative building materials in present context.

4. Understand the alternative building technologies which are followed in present construction field.

Modules	Teaching Hours
Module -1: Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Requirements for buildings of different climatic regions. Green concepts in buildings, Green building ratings – IGBC(Indian Green Building Council). Rainwater harvesting & solar passive architecture. Environmentally friendly and cost-effective building technologies.	08 Hours
 Module -2: Alternate Materials for Construction: Pozzolana cements - (Raw materials, Manufacturing process, Properties and uses). Fibers - (metal and synthetic, Properties and applications). Fiber reinforced plastics - (Properties and applications). Building materials from Agro-industrial wastes, Industrial and mine wastes - (Properties and applications). Masonry blocks using industrial wastes. Construction and demolition waste as building materials. 	10 Hours
Module -3: Elements of Structural Masonry: Masonry, Elements of Structural Masonry, Masonry materials, requirements of masonry units. characteristics of - (bricks, stones, clay blocks, concrete blocks, laterite Blocks, Fal- G blocks and Stabilized mud block). Manufacture of - (stabilized blocks, Aerated Blocks).	08 Hours
Module -4: Structural Masonry Mortars: Cementitious materials, Sand - (natural & manufactured), Mortars, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, compressive strength of masonry elements,	08 Hours

Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect	
of brick bond on strength, Bond strength of masonry.	
Module -5: Equipment for Production of Alternate Materials	
Equipment's for production of stabilized blocks, Machines for manufacture of	
concrete, Moulds and methods of production of precast elements, Cost concepts in	00 11.0000
buildings, Cost saving techniques in planning, Cost analysis: Case studies using	08 Hours
alternatives.	

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

1. Solve the problems of Environmental issues concerned to building materials and cost-effective building technologies;

2. Analyze different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.

3. Understand the different types of masonry units

4. Select the appropriate type of masonry mortar for civil engineering constructions.

5. Learning of different equipment required for manufacturing of building materials and select appropriate equipment for the selected materials.

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.

Text Books:

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International pub.

2. Arnold W Hendry, "Structural Masonry", Macmillan Publishers.

Reference Books:

1. RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley pub.

2. LEED India, Green Building Rating System, IGBC pub. 3. IGBC Green Homes Rating System, CII pub. 4. Relevant IS Codes.

Course Articulation Matrix / Course mapping:

CO#	P01	P02	P03	P04	PO5	P06	P07	P08	P09	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	1	2				2	2		2	3	3	3	1	1
CO2	2	1	3				2	2		2	3	3	3	1	1
CO3	1	2	2			1	1	1		2	3	3	3	2	1
CO4	2	2	3				2	2		2	3	2	3	2	1
CO5	2	2	2				1	2	2	3	3	3	3	3	1

SOLID WAS	STE MANAG	EMENT		
[As per NEP, Outcome Based Education(C VI	[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme] VI SEMESTER			
Course Code	22CV651	CIE	50	
Number of Lecture Hour/Week	3L+1	SEE	50	
Total Number of Lecture Hours	52	Exam Hours	3	
Cl	REDITS –04			
Course Objectives: This course will enable stud 1.Understanding of problems of municipal waste, bio 2. Knowledge of legal, institutional and financial aspe 3.Become aware of Environment and health impacts 4: Identifying recycling and reuse options (composting fly ash, etc.) 5.evaualte different processing methods	ents to medical waste, l ects of managen of solid waste m g, source separa	hazardous waste, e-waste, indust nent of solid wastes. nismanagement tion, and re-use of shredded tires	rial waste etc. , recycled glass,	
Mod	lules		Teaching Hours	
	Module -1			
SOURCES AND TYPES :Sources and types of n generation rates-factors affecting generation, characterization; Effects of improper disposal of s effects. Elements of solid waste management –So waste (M&H) rules – integrated management-Pu	nunicipal solid characteristics solid wastes Pu ocial and Finan blic awareness;	wastes-waste s-methods of sampling and blic health and environmental cial aspects – Municipal solid ; Role of NGO's.	12 hours	
	Module -2			
ON-SITE STORAGE AND SEGREGATION OF – Effect of storage, materials used for containers and economic aspects of open storage – waste s Indian conditions – source reduction of waste – 3	F SOLID WAS – segregation of segregation and BR system	TE . On-site storage methods of solid wastes – Public health l storage – case studies under	8 Hours	
Module -3			I	
COLLECTION AND TRANSFER : Methods of – Collection vehicles – Manpower– Collection Transfer stations – Selection of location, opera conditions – Field problems resolving	Residential and 1 routes – An ation & mainte	d commercial waste collection alysis of collection systems; enance; options under Indian	10 Hours	
Module -4			1	
OFF-SITE PROCESSING Objectives of waste p and Equipment's; Resource recovery from soli Thermal processing options – case studies under	processing – Pl id waste comp Indian conditio	hysical Processing techniques posting and bio methanation; ons.	12 Hours	
	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

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

CO#	Course Outcomes
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

Question Paper Pattern:

The question paper will have ten questions. Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 10 marks.
- 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 a module.

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.
- Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001
- Manser A.G.R. and Keeling A.A.," Practical Handbook of Processing and Recycling of Municipal solid Wastes", Lewis Publishers, CRC Press, 1996
- 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

Course Articulation Matrix / Course mapping:

CO#	P01	P02	P03	P04	PO5	P06	P07	P08	909	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-		2		2		1	2	2		
CO2	3		2		1		2	2	1			2	2		

CO3	2					3		2		2	2		
CO4	3	1	2	2	2	2	2	1	1	2	2	1	
CO5	2	1				3		2	1	2	2	1	

AIR POLLUTION A	AND CONT	ROL	
[As per NEP, Outcome Based Education(OBE) and	d Choice Base	ed Credit System(CB	SCS) Scheme]
SEMESTE	ER - VI		
Subject Code	22CV652	CIE	50
Number of Lecture Hour/Week	4L	SEE	50
Total Number of Lecture Hours	52	Exam Hours	03
CREDITS	- 04		
Course objectives: This course will enable students 1. Study the sources and effects of 2. Learn the meteorological factors 3. Analyze air pollutant dispersion 4. Illustrate particular and gaseous 5. to improve the knowledge on error	s to air pollution. s influencing models. pollution cor nerging trend	air pollution. ntrol methods. s	
Мо	dules		Teaching Hours
Modu	le -1		
Introduction: Definition, Sources, classification and cha	aracterization	of air pollutants.	10Hours
Effects of air pollution on health, vegetation & m	aterials. Typ	es of inversion,	
photochemical smog.			
Module -2			
Meteorology: Temperature lapse rate & stability, wi behavior, measurement of meteorological variables, estimation of effective stack height and mixing depths.	nd velocity o wind rose di	& turbulence, pluma agrams, Plume Rise	e 12Hours
Module -3			
Sampling: Sampling of particulate and gaseous pollupollution), Monitoring and analysis of air pollutants (PN	itants (Stack, M2.5, PM10,	Ambient & indoor SOX, NOX, CO, NH	air 12Hours (3)
Module -4			
Control Techniques: Particulate matter and gaseous p	ollutants- set	tling chambers, cyc	lone 8Hours
separators, scrubbers, filters & ESP.			
Module -5			
Air pollution due to automobiles, standards and contra	rol methods.	Noise pollution cau	ises, 10Hours
effects and control, noise standards. Environmental	issues,globa	l episodes, laws, a	acts,
protocols, Industrial air pollution effect and control.	_	-	
Course Outcomes(COs): On completion of this course, the student will be a	ble to		

CO#	Course Outcomes
CO1	Identify the major sources of air pollution and understand their effects on health and
COI	environment.
CO^{2}	Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality
02	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

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 10 marks.
- 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 a module.
- 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.

Course Articulation Matrix / Course mapping :

CO#	P01	P02	PO3	P04	P05	P06	P07	PO8	60d	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	2	1	1		1	2	1	2	1	1		1		
CO2	2	2	1	1	1	1	2	1	2	1	1		1		
CO3	2	2	1	1	1	1	2	1	1	1	1		1		
CO4	1	1	1	1		2	2	2	2	1	1		1		
CO5	1	2	1	1		2	2	2	2	1	1		1		

EXTENSIVE SURVEY LAB

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

SEMESTER - VI

Subject Code	22CVL66	CIE	50
Number of Lecture Hour/Week	2P	SEE	50
Total Number of Lecture Hours	28	Exam Hours	03
	CREDITS – 01		

Course Learning Objectives: This course will enable students to

1. Understand the practical applications of Surveying.

2. Use Total station and other Measurement Equipments.

3. Work in teams and learn time management, communication, and presentation skills

Course Outcomes(COs):

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

CO #	Course Outcomes
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
COS	Orientation towards conflicts in terms and organizational environment, understanding
COJ	sources of conflicts, conflicts resolution styles and techniques.
1.	NEW TANK PROJECTS: The work shall consist of;
a.	Reconnaissance survey for selection of site and conceptualization of project.
b.	Alignment of center line of the proposed bund, Longitudinal and cross sections of the center
c.	Detailed survey required for project execution like Capacity surveys, Details at Waste weir
d	Design and preparation of drawing with report
2.	WATER SUPPLY AND SANITARY PROJECT: The work shall consist of;
a.	Reconnaissance survey for selection of site and conceptualization of project.
b.	Examination of sources of water supply, Calculation of quantity of water required based on
	existing and projected population.
с.	Preparation of village map by using total station.
d.	Survey work required for laying of water supply and UGD
e.	Location of sites for water tank. Selection of type of water tank to be provided. (ground
	level, overhead and underground)
f.	Design of all elements and preparation of drawing with report.
3.	HIGHWAY PROJECT: The work shall consist of;
a.	Reconnaissance survey for selection of site and conceptualization of project.
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.
с.	Report should justify the selected alignment with details of all geometric designs for
	traffic and design speed assumed.
d.	Drawing shall include key plan initial alignment, final alignment, longitudinal section
	along final
	alignment, typical cross sections of road.
4.	RESTORATION OF AN EXISTING TANK: The work shall consist of;
a.	Reconnaissance survey for selection of site and conceptualization of project.
b.	Alignment of center line of the existing bund, Longitudinal and cross sections of the
	center line.
c.	Detailed survey required for project execution like Capacity surveys, Details at Waste
	weir and sluice points, Canal alignment etc. as per requirement
d.	Design of all elements and preparation of drawing with report.
5.	TOWN/HOUSING / LAYOUT PLANNING: The work shall consist of;
a.	Reconnaissance survey for selection of site and conceptualization of project.
b.	Detailed survey required for project execution like contour surveys
c.	Preparation of layout plans as per regulations
e.	Centerline marking-transfer of centre lines from plan to ground
f.	Design of all elements and preparation of drawing with report as per regulations
Course	outcomes: After studying this course, students will be able to:
1. A	pply Surveying knowledge and tools effectively for the projects
2. U	nderstanding Task environment, Goals, responsibilities, Task focus, working in
Т	eams towards common goals, Organizational performance expectations, technical
aı	nd behavioral competencies.
3. A	pplication of individual effectiveness skills in team and organizational context, goal
se	etting, time management, communication and presentation skills.
4. P 1	rofessional etiquettes at workplace, meeting and general
5. E	stablishing trust based relationships in teams & organizational environment
6. O	rientation towards conflicts in team and organizational environment,
	nderstanding sources of conflicts, Conflict resolution styles and techniques
Keteren	ce Books:
Polovon	, manuals and User manuals
Relevall	

Course Articulation Matrix / Course mapping : Note: 1-Low, 2-Medium, 3-High

CO#	P01	P02	P03	P04	PO5	P06	P07	PO8	P09	P10	111	P12	PSO1	PSO2	PSO3
CO1	1	2	1	1		1	2	1	2	1	1		1	2	3
CO2	2	2	1	1	1	1	2	1	2	1	1		1	1	3
CO3	2	2	1	1	1	1	2	1	1	1	1		1	1	3
CO4	1	1	1	1		2	2	2	2	1	1		1	1	3
CO5	1	2	1	1		2	2	2	2	1	1		2	1	3

SOFTWARE APPLICATION LAB-II [As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme] SEMESTER -VI										
Subject Code	22CVL67	CIE	50							
Number ofLecture Hours/Week	02	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 fundamentals of project management.
- 3. Develop/ generating report.

Course Outcomes(COs):

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

- 1. Understand data structures & create a project
- 2. Create OBS, WBS
- 3. Add activities & create relationships View calendars & schedule project
- 4. Format schedule data ,Define & assign roles and resources
- 5. Optimize the project plan and Execute the project

Sl.	Experiments	Teaching
No		Hours
1	Introduction to Project Management	
	Basics of project management	
	• Importance of project management software like Primavera	
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	28 hours
	• 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	

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

Course Articulation Matrix / Course mapping :

CO#	P01	P02	P03	P04	P05	P06	P07	P08	60d	P10	P11	P12	PSO1	PSO2	FO3
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	

		ENVIRONMENT	AL ENGINEERING	LAB			
[As par]	NED Outcom	B.TECH., VI Ser	nester, Civil Engineerin	ig radit System(C	DCC) Sahamal		
LAS per 1 Subject	Code	22CVL 68		eun system(C	50		
Number of le	ecture hours	220100	CIL		50		
per w	50						
Total number of lecture 28 Exam hours 03							
hou	rs	28	Exam nours		05		
		CR	EDITS 01				
Course Lea	rning Objec	ctives: This course will	l enable students,				
1. To learn	different me	thods of water & waste	e water quality				
2. To condu	ict experime	nts to determine the co	ncentrations of water a	and waste wate	er		
3. To deteri	mine the deg	ree and type of treatme	ent	vinonmontol (n ain a arin a		
4. To under	stand the en	vironinentai significano		ivitoimentai e	engmeeting		
5. Understa	nding profess	sional and ethical respon	sibility				
Course Out	comes(COs)						
On comp	pletion of this	s course, the student will	l be able to				
CO#			Course Outcomes				
CO1	Acquire ca	apability to conduct exp s.	periments and estimate	the concentra	tion of different		
CO2	Compare t	he result with standard	s and discuss based on	the purpose of	of analysis.		
CO3	Determine	type of treatment deg	ree of treatment for wa	ter and waste	water		
	Identify th	ne parameter to be ana	lyzed for the student	project work	in environmental		
04	stream.	1	•				
CO5	Compute a	nd visualize the working	g of various units and w	rite report.			
		EXPERIMENT	ГS		Teaching Hours		
1. Prepar	ration chemi	cal reagents required for	or laboratory analysis b	by standard	2HR		
metho	$\frac{\mathrm{od.}}{\mathrm{c}}$		1.00 1.114		2110		
2. Detern	mination of p	OH, Conductivity, TDS	and Turbidity.		2HK 2HD		
3. Detern	111111111111111111111111111111111111	Aikannity			2ПК 2НР		
5. Detern	mination of C	Calcium. Magnesium a	nd Total Hardness.		211K 2HR		
6. Deterr	mination of I	Dissolved Oxygen			2HR 2HR		
a.	Determinat	ion of BOD.					
7. Detern	mination of (Chlorides			2HR		
8. Detern	mination of p	percentage of % of available	ilable chlorine in bleac	hing	2HR		
powde	er sample, D	etermination of Residu	al Chlorine and chlorin	ne demand.			
9. Detern	mination of S	Solids in Sewage: i) To	tal Solids, ii) Suspende	ed Solids,	2HR		
iii) Di	ssolved Soli	ds.iv) volatile solids	• •		4 11D		
10. Detern	mination of c	optimum coagulant dos	age using Jar test appa	iratus.	2HR		
11. Deteri	mination of I	ruonueu by spectroph	otometer		2HK		
12. Detern	mination of I	Nitrate by spectrophoto	ometer		2HR		
13. Detern	13. Determination of Sulphate by spectrophotometer2HR						

14. Determination of COD(Demonstration), Air Quality Monitoring (Demonstration), Sound pollution Monitoring (Demonstration)	2HR
Course Outcomes: After studying this course, students will be able to:	
1. Acquire capability to conduct experiments and estimate the concentration of diffe	erent parameters.
2. Compare the result with standards and discuss based on the purpose of analysis.	
3. Determine type of treatment, degree of treatment for water and waste water.	
4. Identify the parameter to be analyzed for the student project work in environme	ntal stream.
Question paper pattern:	
Two experiments shall be asked from the above set of experiments.	
One experiment to be conducted and for the other student should write detailed proce	edure.
References	
1. IS codes-3025 series	
2. Standard method for examination of water and waste water, APHA, 20 th edition	
Clair Sawyer and Perry McCarty and Gene Parkin, "Chemistry for Environmental Eng	gineering and
Science", McGraw-Hill Series in Civil and Environmental Engineering.	-

Course Articulation Matrix / Course mapping :

CO#	P01	P02	P03	P04	P05	P06	P07	P08	909	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	

	DDAIECT VI			
р теси	VI Semester Civil E	Ingineering		
D. I ECH.	ion(OBE) and Choice	Based Credit System	(CBCS) Schemel	
[As per NEF, Outcome Dased Educat		CIE Marila		
Subject Code	22PRJ09	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 ta	ught to:			
1. Get exposure about the civil eng	ineering coursework	to solve real-world pro	oblems.	
2. Design the working model of th	e open ended problem	1.		
3. Understand concepts of safety d	urability and environ	mental impacts.		
4. Understand the latest technology	y and software tools.	1		
5 Prepare technical documentation of the project				
STUDENTS WILL BE GIVEN A OPE	N ENDED PROBLEI	M OF THE SOCIETY	AND ASKED TO	
SOLVE BY DESIGNING AND IMPL	EMENTING THE SY	YSTEM IN TEAM.		
Course outcomes: After studying this	course, students will b	be able to:		
CO1 Apply the knowledge of civil end	vineering and to solve	the real time problem	s of the society.	
CO^2 Analyze the various existing solu	itions available to sol	ve the real time proble	em and propose the	
best solution		ve the real time proble	in and propose the	
CO3 Design and implement the system	n to solve the real tim	e problem of the socie	-tx/	
CO4 Conduct investigations on the out	it to solve the real thin	technical documentati	ion of the designed	
sustam in a team	input and propare the		ion of the designed	
System in a team.	a advanced astronom	4 a a 1 a		
COUPER OUTCOME AND DDGGD	e auvanced sonware	1001S.		
COURSE OUTCOME AND PROGRA	AMME OUTCOME	MAPPING (1/2/3):		

CO/PO														
	0.1	0.2).3). 4	0.5). 6	7.0	0.8	6.0	.10	.11	.12	0.1	0.2
	P(P(P(P(P(P(P(P(P(Ю	РО	PO	PS	Sd
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 IND	CONSTRUCTION INDUSTRIAL SAFETY ENGINEERING						
[As per NEP, Outcome Based Education	n(OBE) and Choice	Based Credit System(Cl	BCS) Scheme]				
	SEMESTER						
Course Code	22ACV611A	CIE	50				
Number of Lecture Hour/Week	01	SEE	50				
Total Number of Lecture Hours14Exam Hours03							
	CREDITS -01						

Course Objectives: This course will enable students to

CO1: Describe the theories of accident causation and preventive measures of industrial accidents. (Cognitive Knowledge level: Understand)

CO2: Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping. (Cognitive Knowledge level: Understand)

CO3: Explain different issues in construction industries. (Cognitive Knowledge level: Understand)

CO4 : Describe various hazards associated with different machines and mechanical material handling. (Cognitive Knowledge level: Understand)

CO5 : Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards. (Cognitive Knowledge level: Apply)

Modules	Teaching Hours
Module I	
Safety introduction : Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages.	5 hours
Module II	
Personal protection in the work environment , Types of PPEs, Personal protective equipment- respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.	6 Hours
Module III	
Safety issues in construction: Introduction to construction industry and safety issues in construction Safety in various construction operations – Excavation and filling – Under-water works – Under-pinning & Shoring – Ladders & Scaffolds – Tunneling – Blasting – Demolition – Confined space – Temporary Structures. Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety. Relevance of ergonomics in construction safety. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders.	7Hours
Module IV	

Safety hazards in machine: Machinery safeguard-Point-of-Operation, Principle of machine
guarding -types of guards and devices. Safety in turning, and grinding. Welding and Cutting-
Safety Precautions of Gas 4 welding and Arc Welding. Material Handling-Classification-
safety consideration- manual and mechanical handling. Handling assessments and techniques-
lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling equipment-
operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks,
clamps. Hearing Conservation Program in Production industries.7Hours

Module V

(Hazard identification and analysis :Hazard and risk, Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards: Inventory analysis, Fire and explosion hazard rating of process plants - The Dow Fire and Explosion Hazard Index, Preliminary hazard analysis, Hazard and Operability study (HAZOP)) – methodology, criticality analysis, corrective action and follow-up. Control of Chemical Hazards, Hazardous properties of chemicals, Material Safety Data Sheets (MSDS).

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

CO#	Course Outcomes
CO1	1. Which are the various accident causation theories? Explain. 2. Define terms: Accident,
COI	Reportable accident, Dangerous occurrence.
	1. Discuss different types of personal protective equipment 2. Discuss about how to
CO2	compare the safety performance of two industries. 3. Discuss the significance of work
	permit system in accident prevention.
	1. Distinguish ladders and scaffolds along with their safety features.
CO3	2. Discuss the safety requirement for a confined space entry.
	3. Explain the important provision in the National Building Code.
CO4	1. Explain the various principles used in machine guarding.
C04	2. Explain the issues in mechanical material handling.
	1.Selection of different types of fire extinguishers accordance to type of fire.
CO5	2.Conduct a HAZOP study for a batch rector of your choice.
	3. Determine different types of Chemical hazards associated with industries

Question Paper Pattern:

The question paper will have ten questions.

Text Books:

- 1. R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.
- 2. Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication.
- 3. Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, New Delhi.
- 4. John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All India Traveller Book Seller, Delhi.
- 5. Ronald P. Blake. (1973). Industrial safety. Prentice Hall, New Delhi.

Reference Books:

- 1. Alan Waring. (1996). Safety management system. Chapman & Hall, England.
- 2. Vaid, K.N., (1988). Construction safety management. National Institute of Construction Management and Research, Mumbai.
- 3. AIChE/CCPS. (1992). Guidelines for Hazard Evaluation Procedures. (second edition). Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York.

Course Articulation Matrix / Course mapping:

CO#	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
CO1	2	2				2	2	2				1	2	1	
CO2	2	1	2		1	1	1	1				1	1	2	3
CO3	2	2	2		1	1	1	1	1	1		1	2	2	3
CO4	2	2	2		1	1	1	1	1	1		1	1	2	3
CO5	2	2	2	1	1	1	1	1	1	1		1	1	2	3

	DR	ONE SURVEYIN		o 1 - 1				
	[As per NEP, Outcome Based Educatio	SEMESTER	Based Credit System(CBCS)	Schemej				
	Course Code	22ACV611B	CIE	50				
	Number of Lecture Hour/Week	01	SEE	50				
	Total Number of Lecture Hours14Exam Hours							
		CREDITS -01						
Cour	se Objectives: This course will enable s	students to						
1.	This course introduces the basic conce	epts of drone surveyi	ng.					
2.	This course covers image processing a	and photogrammetry	of drone data.					
3.	It also covers the mapping, modelling	g and application of	drone surveying in various	fields of Civil				
	Engineering.							
				Teaching				
	Ν	Aodules		Hours				
	Мо	dule I						
Introd results execu	luction to Drones, History of Drone/UA s, Regulations of DGCA and Drone lice tion and photography, data collection- I	S/UAVs, payload, banse, Pre and Post Fli mage Format, GSD,	attery life, Specs for good ght planning- Flight Scale and Resolution	2 hours				
	Mo	dule II						
SUR survey vertice Autor	VEYING WITH DRONE: Consideratio ying drone and its accuracy, Techniques al and horizontal accuracies, Planning a nomous flight vs. manual and hybrid flig	n for hardware selec of controlling errors nd estimation of drom th profiles	tions,comparison on s, Consideration of GCP in ne surveying jobs,	2 Hours				
	Mod	lule III						
IMAC proces Measu genera	GE PROCESSING AND PHOTOGRAN ssing softwares, Analyzing Data, Conto- urement Calculation and orthophoto ation.	METRY: Aerial Tr uring, DEM, DSM, (iangulation, post Cut,Fill, and Volumetric	3Hours				
	Mod	lule IV						
MAPI Under platfo	PING AND MODELING: Introduction standing RTK, PPK and GCP's, Overvi rms and functions.	to mapping and mod iew of popular data p	elling concepts, processing software	3Hours				
	Mo	dule V						

DRONE APPLICATIONS: Application of drone for Surveying & Mapping-Construction, Irrigation and Agricultural, Engineering Land Survey and Transportation.	4Hours
Course Outcomes: After studying this course, students will be able to:	

CO#	Course Outcomes
CO1	Explain the fundamentals of Drone surveying
CO2	Describe the Methods of Surveying with Drone
CO3	Explain the concepts of Image processing and Photogrammetry
CO4	Explain modelling with Drones
CO5	Discuss the Drone applications

Question Paper Pattern:

The question paper will have ten questions.

Text Books:

1."Remote Sensing and Image Interpretation", Lillesand and Kiefer, 5th Edition, John Wiley and Sons, 2008

2 "One Nation Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems", John E. Jackson

Reference Books:

1."Remote Sensing and Geographical Information System", A.M. Chandra, S.K. Ghosh, Narosa Publishing house, 1st Edition, 2007

2 "Aerial Photography and Image Interpretation", David P Paine, Wiley Higher Education, 2nd Edition, 2006

3 "Drones and Support for the Use of Force", James Igoe Walsh.

Course Articulation Matrix / Course mapping:

CO#	P01	P02	PO3	P04	P05	P06	707	P08	60d	P010	P011	P012	PSO1	PSO2	PSO3
CO1	1				2				1			1	2	1	
CO2	1				2				1			1	1	2	
CO3	1				2				1			1	2	1	3
CO4	1	1			2				1			1	1	2	3
CO5		1			2				1			1	1	2	3