DIRECTORATE OF TECHNICAL EDUCATION, KAHILIPARA, GUWAHATI-19

DIPLOMA PROGRAMME IN

CIVIL ENGINEERING

NEW SYLLABUS

SIXTH SEMESTER
CIVIL ENGINEERING BRANCH

COURSE STRUCTURE OF CIVIL ENGINEERING

6TH SEMESTER

Subject Code	Subject	Study Scheme (contact hour/week)			Evaluation Scheme									Total Mark (Th+Pr)	Credit
					Theory					Practical					
						Sessional (SS)			Pass (ESE+SS)						
		L	T	P	ESE	TA	HA	Total(TA+HA)		PT	PA	Pass mark (PT+PA)			
Hu-601	Industrial management & Entrepreneurship	3			70	10	20	30	33					100	3
CV-601	Design of Steel Structure	4	1		70	10	20	30	33					100	4
CV-602	Estimating-II	3			70	10	20	30	33					100	3
CV-603	Environmental Engineering &Pollution Control	3	1	3	70	10	20	30	33	25	25	17		150	4
Cv-611	Project & Seminar			6						100	50	50		150	3
Cv-612	General Viva		2							50		17		50	2
CV-610	Professional Practice-IV	1		2						25	25	17		50	2
OPTIONAL (ANY ONE)															
CV-604	Building Repair & Maintenance	3		3	70	10	20	30	33	25	25	17		150	4
CV-605	Railway Bridge & Tunnel Engineering	3		3	70	10	20	30	33	25	25	17		150	4
Total		18	3	14											
		35			Grand Total =									850	25

1: Course Title : Industrial Management and Entrepreneurship

4. Course Code: **Hu – 601**
5. Semester: **VI**
6. **Aim of the Course:**
    1. To acquaint the students with managerial activities
    2. To provide introductory knowledge of Cost Accounting
    3. To introduce students with industrial legislation
    4. To explain the scope for self-employment
    5. To compare and contrast different forms of business organization
    6. To identify the opportunities to start a small scale industry
7. **Course Outcomes**:

On completion of the course on IME, students will be able to

- CO_1 = explain managerial activities.
- CO_2 = describe leadership qualities and decision making process.
- CO_3 = state the elements of costs.
- CO_4 = explain important industrial laws.
- CO_5 = define different forms of business organisations
- CO_6 = identify entrepreneurial abilities for self employment through small scale industries.

8. **Teaching Scheme (in hours)**

Lecture	Tutorial	Practical	Total
42hrs	3 hrs	--	45 hrs

9. **Examination Scheme:**

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

10. **Detailed Course Content**:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
				42 hrs
1.0	**Introduction to Management :**	i) Meaning and Concept ii) Functions of Management iii) Principles of Management	i) Explain functions and principles of management	3
2.0	**Leadership Decision Making & Communication :**	i) Definition of Leader ii) Functions of a leader iii) Decision making – Definition iv) Decision making process v) Communication – definition, importance & types	i) Develop leadership qualities ii) Demonstrate decision making abilities	4
3.0	**Introduction to Cost :**	i) Definition and classification of Cost	i) State elements of costs ii) Explain	3

		ii) Elements of Cost iii) Break Even Analysis	Break Even Analysis	
4.0	**Human Resource Management:**	i) Meaning of manpower planning ii) Recruitment and Selection procedure iii) Payment of wages – factors determining the wage iv) Methods of payment of wages – Time rate and Piece rate v) Labour Turnover – definition, its causes, impact and remedy	i) State selection procedure of employees ii) Distinguish Time rate and Piece rate system of wage payments iii) Explain causes and impact of labour turnover	5
5.0	**Industrial Legislation :**	i) Need of Industrial legislation ii) Indian Factories Act – 1948 – Definition of Factory, main provisions regarding health, Safety and Welfare of Workers iii) Industrial Dispute Act – 1947 – Definition of	i) Identify the needs and importance of industrial laws	5

		Industrial dispute, Machineries for settlement of Industrial dispute in India		
6.0	**Production Management :**	i) Meaning of Production ii) Production Management – definition, objectives, functions and scope iii) Inventory Management, Basic idea	i) State the objectives and functions of Production management	3
7.0	**Marketing Management:**	i) Meaning and functions of marketing ii) e- Commerce iii) Channels of distribution iv) Wholesale and retail trade	i) state the functions of wholesalers and retailers	2
8.0	**Entrepreneur andEntrepreneurship:**	i) Definition of Entrepreneur and Entrepreneurship ii) Qualities required by an entrepreneur iii) Functions of an entrepreneur iv) Entrepreneurial motivation	i) State the qualities and functions of an entrepreneur	3
9.0	**Forms of Business Organisation:**	i) Sole Trader – meaning, main features, merits and demerits ii) Partnership –	i) Differentiate different forms of Business organization	5

		definition, features, merits and demerits iii) Joint Stock Company – Definition, types, features, merits and demerits	ii) compare and contrast features, merits and demerits of different business organizations .	
10.0	**Micro and Small Enterprises:**	i) Definition of Micro & Small enterprises ii) Meaning and characteristics of Micro and Small enterprise iii) Scope of SSI with reference to self-employment iv) Procedure to start SSI – idea generation, SWOT analysis v) Selection of site for factories	i) Define micro and small enterprises ii) Explain the procedure to start a small enterprise	4
11.0	**Support to Entrepreneurs**	a) Institutional support: i) Introduction ii) Sources of information and required application forms to set up SSIs iii) Institutional support of various National & State level organizations – DICC, NSIC, IIE, MSME - DI, Industrial Estates	i) identify the supporting agencies to entrepreneurs ii) Explain the role of financial support organisations	5

		b) Financial support: i) Role of Commercial banks, RRB, IDBI, ICICI, SIDBI, NEDFi, and State Financial Corporations ii) Special incentives and subsidies for Entrepreneurship Development in the North East		
	Class Test			3 hrs
	Total			**45 hrs**

(9) TABLE OF SPECIFICATIONS for Industrial Management & Entrepreneurship

Sl. No	**Topic** (a)	**Time allotted in hours (b)**	**Percentage Weightage (c)**	Knowledge	Compre-hension	**Application**	**HA**
1	Introduction to Management	3	7	2	3	0	0
2	Leadership & Decision Making	4	9.5	3	4	0	0
3	Introduction to Cost	3	7	3	2	0	0
4	Human Resource Management	5	12	6	2	0	0
5	Industrial Legislation	5	12	4	4	0	0
6	Production Management	3	7	3	2	0	0
7	Marketing Management	2	5	4	0	0	0
8	Entrepreneur & Entrepreneurship	3	7	3	2	0	0
9	Forms of Business	5	12	3	5	0	0

	Organisation						
10	Micro & Small Enterprises	4	9.5	4	3	0	0
11	Support to Entrepreneurs	5	12	4	4	0	0
Total		**42**	**100**	**39**	**31**	**0**	**70**

K = Knowledge C = Comprehension A = Application HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$C = \frac{b}{\sum b} \times 100$

10. Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR IME

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Management	1	0	0	1	1	0	0	0	1	0	3	0	0	3	5
2	Leader &Decisi	1	0	0	1	2	1	0	0	3	0	3	0	0	3	7
3	Cost	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
4	HRM	2	1	0	3	1	1	0	0	2	3	0	0	0	3	8
5	Laws	3	0	0	3	0	0	0	0	0	1	4	0	0	5	8
6	Product Manage	2	1	0	3	1	1	0	0	2	0	0	0	0	0	5
7	Market	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
8	Entrepreneurship	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
9	Forms of BO	2	1	0	3	0	0	0	0	0	1	4	0	0	5	8
10	MSME	2	0	0	2	0	0	0	0	0	2	3	0	0	5	7
11	Support to Entp.	3	0	0	3	1	0	0	0	1	0	4	0	0	4	8
	Total	**20**	**5**	**0**	**25**	**12**	**5**	**0**	**0**	**17**	**7**	**21**	**0**	**0**	**28**	**70**

K = Knowledge C = Comprehension A = Application
HA = Higher Than ApplicationT = Total
Higher than Application (Analysis, Synthesis, Evaluation)

11. Suggested implementation Strategies: Modified syllabus may be implemented with effect from January, 2020 (Starting with the present batch (2018) of 2nd Semester students)

12.Suggested learning Resource:

a. **Book list** :

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Industrial Management	S.C. Jain H.S. Bawa	DhanpatRai& Co. (P) Ltd. New Delhi-110006
2	Business Organisation and Entrepreneurship Development	S.S. Sarkar R.K. Sharma Sashi K. Gupta	Kalyani Publishers, New Delhi-110002
3	Entrepreneurial Development	S. S. Khanka	S. Chand & Co. Ltd. New Delhi-110055
4	Business Methods	R.K. Sharma Shashi K Gupta	Kalyani Publishers, New Delhi
5	Entrepreneurship Development and Management	Dr. R.K. Singhal	S.K. Kataria& Sons, New Delhi-110002
6	Business Administration & Management	Dr.S.C.Saksena	SahityaBhawan, Agra
7			
8			

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b. List of Journals
c. Manuals
d. Others

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2:Course Title :- ESTIMATING –II

1. **Course Code :- CV-602**
2. **Semester :- 6th (Civil)**
3. **Objective of the Subject/ Courses :-**

Objective:- Studentwill be able to

- Calculate the approximate cost of civil structure
- Prepare check list of items of construction
- Prepare estimate of civil engineering works.
- Prepare rate analysis of items of construction.
- Specifications of various items of construction works.
- Calculate earth works involved in roads and canals.

Course outcomes :-

After completion of this course, the students will be able to –

CO 1	-	prepare estimates of Civil Engineering works.
CO 2	-	analyze the rates of different items of construction.
CO 3	-	demonstrate the concept of specification required in the course.
CO 4	-	calculate the approximate cost of Civil Engineering structures.
CO 5	-	explain the method of executing Departmental Works
CO 6	-	prepare Measurement Book as PWD hand book.

COs and ILOs of Estimating II

COs	ILOs
1. PREPARE ESTIMATES OF CIVIL ENGINEERING WORKS	**1.** Calculate the quantity of earth work by a. Mid sectional area method b. Mid depth method c. Prismoidal formula method

COs	ILOs
	2. define lead and lift **3.** show the tabular forms of each method of calculation of earth work **4.** describe the units of measurement of various items of

	road work. **5.** explain the methods of estimating earth work for road embankment and canal. **6.** find out different items of Hard Crust for bituminous road. **7.** compare the most accurate method of estimating earth work of road/ canal.
2. ANALYSE THE RATES OF DIFFERENT ITEMS OF CONSTRUCTION	**1.** explain the meaning of the term 'rate analysis' **2.** state the main features of rate analysis. **3.** enumerate the factors effecting rate analysis. **4.** Analyze the rate of a. Brick work b. PPC work c. RCC work d. Doors and Windows. e. Plastering f. Cement concrete floor g. White washing h. Centering and plastering i. DPC j. Earth work for foundation **5.** Prepare checklist for different types of construction work.
3. DEMONSTRATE THE CONCEPT OF SPECIFICATION REQUIRED IN THE COURSE	**1.** classify specification **2.** distinguish between General specification and Detailed specification. **3.** state general specifications of an RCC building.

	4. write the detailed specification of a. Earth work in excavation. b. First class brickwork c. Wood Work in doors and windows

	d. GI sheet and AC sheet roofing e. C.C. Floor f. Tile flooring g. RCC works h. Centering and shuttering i. White washing j. Plastering
4. CALCULATE THE APPROXIMATE COST OF CIVIL ENGINEERING STRUCRTURES	1. estimate the approximate cost of a given Civil Engineering structure using the latest PWD schedule of rates
5. EXPLAIN THE METHOD OF EXECUTING DEPARTMENTAL WORKS	1. define the term 'contract' 2. Classify contract. 3. describe in brief Administrative approval, technical sanction contingencies, budget, tender, earnest money, security deposit, running bill and final bill. 4. describe E tendering
6. PREPARE MEASUREMENT BOOK AS PWD HAND BOOK	1. explain the use of Measurement Book 2. make entries in the Measurement Book 3. state the general rules for units of measurement for different items of work as PWD hand book. 4. state in brief about master roll.

Pre-requisite:-

- Student should have basic knowledge about calculation of area, volume of objects.

4. Teaching Scheme (in hours/week)

Total contact hours : Lecture 45 hrs. Tutorial 15 hrs.

Lecture	Tutorial	Practical	Total
3			3

5. Examination Scheme:-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr.)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						3
70	10	20	33/100				100	

6. Detail course content

Chapter No	Chapter Title	Content	Duration (in hours)
1	**Earthwork**	➢ Method of calculation of quantity of earthwork by a. Mid sectional area method b. Mid depth method c. Prismoidal formula method ➢ Lead and lift ➢ Tabular forms of each method of calculation of earth work.	8
2	**Roadwork**	➢ Unit of measurement of various items of road work ➢ Method of estimating various items of road work	3
3	**Rate analysis**	➢ Analysis of rates- its meaning and main features. ➢ Factors effecting rate analysis ➢ Analysis of rate of a. Brick work b. PCC work c. RCC work d. Doors and windows e. Plastering f. Cement concrete floor g. Whitewashing h. Centering and plastering i. DPC j. Earth work for foundation	9
4	**Specification**	➢ Specification and its type a. General specification b. Detailed specification ➢ General specification of an RCC building	9

		➢ Detailed specification of a. Earth work in excavation b. First class brick work c. Wood work in doors and windows d. CGI sheet and AC sheet roofing e. Cement concrete floor f. Tile flooring g. RCC works h. Centering and shuttering i. White washing j. plastering	
5	**Departmental works**	➢ Contracts, various types of contract, item rate contract, lump sum contract, labor contract, contract agreement. ➢ Administrative approval, technical sanction, contingencies, budget, tender, earnest money, security deposit, running bill and final bill. ➢ E tendering ➢ Measurement book (MB) use, entries made in MB, general rules for units of measurement for different items of work as PWD hand book. ➢ Master roll	10
6	**Revision and Class test**	➢ Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	6

7. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	**Earthwork**	5	7	12
2	**Roadwork**	2	5	07
3	**Rate analysis**	5	10	15
4	**Specification**	5	10	15
5	**Departmental works**	8	13	21
		25	45	70

9.Table of Specification for Estimating-II (CV-602)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Earthwork	8	18	1	4	7	
2	Roadwork	3	7	1	1	5	
3	Rate analysis	9	20	1	5	9	
4	Specification	9	20	1	5	9	
5	Departmental works	10	22	4	7	10	
6	Internal assessment	6	13	-	-	-	-
		∑b=39 hrs.+ 6hrs internal assessment	100	8	22	40	

10. Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	***T***	K	C	A	HA	***T***
1	Earthwork	1	2	2	***5***		2	5		***7***
2	Roadwork	1	1		***2***			5		***5***
3	Rate analysis	1	2	2	***5***		3	7		***10***
4	Specification	1	2	2	***5***		3	7		***10***
5	Departmental works	2	3	3	***8***	2	4	7		***13***
	Total				***25***					***45***

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11.Suggested Implementation Strategies :- Teacher will use Black board, OHP, Smart board, Video etc for effective teaching learning process.

12.Text books:

Titles of the book	Name of author	NAME OF PUBLISHER
Estimating and costing in civil engineering	B.N. Dutta	UBS publication
Civil Engineering contracts and estimates	B.S. Patil	Universities press
Estimating and costing	G.S. Birdie	DhanpatRai and Sons
Civil Estimating & Costing	A K Upadhyay	S K Kataria& Sons

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

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3:Course Title :- ENVIRONMENTAL ENGINEERING & POLLUTION CONTROL

1. **Course Code :- CV-603**
2. **Semester :- 6th (Civil)**
3. **Objective of the Subject/ Courses :-**

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

* Estimate water demands for a certain locality
* Analyze the quality and standard of potable water
* Suggest the treatment required by knowing the quality of water
* Handle the sewerage system.
* Analyze the sewage
* Suggest the waste water treatment
* Suggest the treatment for industrial waste
* Know the solid waste management

CO's and ILO's of ENVIRONMENTAL ENGINEERING & POLLUTION CONTROL

CHAPTER TITLE	After the completion of the chapter, the students will learn
Introduction	➢ Environmental Pollution and its types. ➢ Causes of Pollution. ➢ Effects of Pollution. ➢ Control of Pollution. ➢ Existing laws related to Environmental Pollution.
Water Supply	➢ Demands of water- Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand, Factors affecting rate of Demand, Variations of water demand. ➢ Forecasting of population, Methods of forecasting of population. ➢ Design period for water supply scheme. ➢ Sources of Water. ➢ Intake Structures- Definition and types. ➢ Ground water recharging – Necessity, importance and advantages. ➢ Need for analysis quality of water. ➢ Characteristics of water- Physical, Chemical and Biological. ➢ Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests. ➢ E coli index, MPN. ➢ Sampling of water. ➢ Water quality standards as per Indian Standard & World Standard (WHO). ➢ Aeration- Objects and methods of aeration. ➢ Plain sedimentation, Sedimentation with coagulation, principles of

	coagulation, types of coagulants, Jar Test, process of coagulation. ➢ Classification of filters- slow sand filter, rapid sand filter, pressure filter, construction and working of slow sand filter and rapid sand filter. ➢ Disinfection- Objects, methods of disinfection. ➢ Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance. ➢ Miscellaneous water Treatments (Water Softening, Defluorination techniques). ➢ Flow diagram of water treatment plants. ➢ Conveyance and Distribution of Water- Layouts of distribution of water- dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.
Domestic Sewage	➢ Importance and necessity of sanitation, Necessity to treat domestic sewage. ➢ Recycling and Reuse of domestic waste. ➢ Definitions- Sewage, sullage, types of sewage. ➢ Definitions of the terms related to Building Sanitation- Building Sanitary fittings- Water closet – Indian and European type, Traps- types, qualities of good trap, Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan). ➢ Systems of Sewerage-Types of Sewers, Systems of Sewerage, Self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers. ➢ Sewer Appurtenances-Manholes and Drop Manhole-component parts, ,location, spacing, construction details, Sewer Inlets , Street Inlets, Flushing Tanks – manual and automatic. ➢ Analysis of Sewage, Characteristics of sewage, B.O.D./ C.O.D. and significance ➢ Aerobic and anaerobic process. ➢ Treatment of Sewage, Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming. ➢ Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process. ➢ Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch.
Industrial Waste	➢ Characteristics of industrial waste water from sugar, dairy, distillery, textile, paper and pulp and oil industries and their suggestive treatments.
Environmental Pollution	➢ Sources of Air Pollution and Noise Pollution ➢ Effects and Control of Air Pollution and Noise Pollution ➢ Global warming ➢ Acid Rain ➢ Ozone hole
Solid Wastes from Society	➢ Solid Waste Management. ➢ Definitions- Refuse, Rubbish, Garbage, Ashes. ➢ Constituents of solid wastes. ➢ Sources of solid wastes, Collection of Solid Wastes. ➢ Methods of collection of solid wastes. ➢ Methods of treatment and disposal of solid waste. ➢ Types of hazardous wastes. ➢ Characteristics of hazardous wastes.

	➢ Treatment and disposal of hazardous waste.
Environmental Sanitation	➢ Environmental Sanitation and its necessity and importance. ➢ Types of Privies – Aqua privy and Bore Hole Latrine.

4. Teaching Scheme (in hours/week) **Total contact hours : Lecture 45 hrs. + Tutorial= 15 hrs.**

Lecture	Tutorial	Practical	Total
3	1	3	7

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr.)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						4
70	10	20	33/100	25	25	17/50	150	

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	**Introduction**	1.1 Introduction Environment, Ecosystem, Environmental Pollution and its types, Causes of Pollution, Effects of Pollution, Control of Pollution, Existing laws related to Environmental Pollution.	2
2	Water Supply	**PUBLIC WATER SUPPLY** 2.1 Quantity of Water Demands of water: Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand ; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Numerical Problem), Design period for water supply scheme. 2.2 Sources of Water Surface and Subsurface sources of water, Intake Structures- Definition and types, Ground water recharging – Necessity Importance and advantages. 2.3 Quality of Water	14

		Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN, Sampling of water, Water quality standards as per Indian Standard & World Standard (WHO) 2.4 Purification of Water Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, classification of filters : slow sand filter, rapid sand filter, pressure filter, construction and working of slow sand filter and rapid sand filter, Disinfection: Objects, methods of disinfection, Chlorination-Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Miscellaneous water Treatments (Water Softening, Defluorination techniques) , Flow diagram of water treatment plants. 2.5 Conveyance and Distribution of Water - Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages	
3	Domestic Sewage	3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage 3.2 Building Sanitation Definitions of the terms related to Building Sanitation- Building Sanitary fittings- Water closet – Indian and European type, Traps- types, qualities of good trap, Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan) 3.3 Systems of Sewerage-Types of Sewers, Systems of Sewerage, Self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers. 3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts,, location, spacing, construction details, Sewer Inlets , Street Inlets, Flushing Tanks – manual and automatic	10

		3.5 Analysis of Sewage Characteristics of sewage, B.O.D./ C.O.D. and significance., Aerobic and anaerobic process, 3.6 Treatment of Sewage Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch	
4	Industrial Waste	4.1 Industrial Waste Water Characteristics of Industrial waste water, from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments	3
5	Environmental Pollution	5.1 Air Pollution and Noise Pollution Sources, Effects and Control of Air Pollution, Effects and Control of Noise Pollution (only brief idea) Global warming, Acid Rain, Ozone hole	3
6	Solid Wastes from Society	**SOLID WASTES FROM THE SOCIETY** 6.1 Solid Waste Management Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of, solid wastes, Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste. 6.3 Hazardous Wastes Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous waste	5
7	Environmental Sanitation	7.1 Environmental Sanitation Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine.	3
8	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	5

8. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/Descriptive Questions	
1	Introduction	2		2
2	Water Supply	6	15	21
3	Domestic Sewage	5	10	15
4	Industrial Waste	4	6	10
5	Environmental Pollution	4	4	8
6 &7	Solid Waste from Society & Environmental Sanitation	4	10	14
Total		25	45	70

9. Table of Specification for Environmental Engineering &Pollution Control (CV-603)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	2	4	1	1		
2	Water Supply	14	30	3	5	13	
3	Domestic Sewage	10	22	1	4	10	
4	Industrial Waste	3	7	4	6		
5	Environmental Pollution	3	7	2	6		
6	Solid Waste from Society	5	10	1	6		
7	Environmental Sanitation	3	7	1	6		
8	Internal assessment	6	13	-	-	-	-
		∑b=40 hrs.+ 6hrs internal assessment	100	13	34	23	

10.Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	***T***	K	C	A	HA	***T***
1	Introduction	1	1		***2***					
2	Water Supply	1	2	3	***6***	2	3	10		***15***
3	Domestic Sewage	1	1	3	***5***		3	7		***10***
4	Industrial Waste	2	2		***4***	2	4			***6***
5	Environmental Pollution	2	2		***4***		4			***4***
6	Solid Waste from Society	1	1		***2***		5			***5***
7	Environmental Sanitation	1	1		***2***		5			***5***
	Total				***25***					***45***

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11. Suggested Implementation Strategies :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process. Suggested Learning Resource :-

12.Book list

Text Books:			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
Santosh Garg	Environmental Engineering (Volume I & II)		Khanna Publishers
Kamla A. &Kanth Rao D. L.	Environmental Engineering		Tata McGraw Hill
Birdie G. S. Birdie J. S.	Water Supply and Sanitary Engineering		DhanpatRai& Sons
Deolalikar S.G.	Plumbing – Design and Practice		Tata McGraw Hill
Rao M.N. Rao H.V.N.	Air Pollution		Tata McGraw Hill
AK Upadhyay& D Lal	Water Supply & Waste Water Engineering		S K Kataria& Sons

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

XXXXXXXXXXXXXXXXX

3:Course Title :- ENVIRONMENTAL ENGINEERING & POLLUTION CONTROL (PRACTICAL)

- **Contact hrs. :- 45 hrs.**
- **Course Code :- CV-603**
- **Semester :- 6th (Civil)**

Practical :

Skills to be developed:

INTELLECTUAL SKILLS:

1. Identify the method for testing of water.
2. Interpret the results

MOTOR SKILLS:

1. Observe chemical reactions
2. Handle instruments carefully.

List of Practical:

Water Supply Engineering:

1) To determine fluoride concentration in given water sample
2) To determine the turbidity of the given sample of water.
3) To determine residual chlorine in a given sample of water.
4) To determine suspended solids, dissolved solid, and total solids of water sample
5) To determine the dissolved oxygen in a sample of water
6) To determine the optimum dose of coagulant in the given sample by jar test.

Sanitary Engineering:

1) To determine the dissolved Oxygen in a sample of waste water.
2) To determine B.O.D. of given sample of waste water.
3) To determine C.O.D. of given sample of waste water.
4) To determine suspended solids, dissolved solids and total solids of waste water sample.
5) Design the Septic, Tank for the public building such as hostel or hospital. Draw Plan and section of the same along with the drainage arrangement in soak pit.
6) To determine various pollutant levels in the atmosphere using Digital Air Volume sampler.
    a) Energy generation plants from solid wastes.

XXXXXXXXXXXXXXXXXXXXX

4 Course Title : DESIGN OF STEEL STRUCTURES (Duration of Exam = 4 hours)

1. **Course Code:** : **Cv-601**
2. **Semester** : **6th**
3. **Objective of the subject/ Course** : **Design of steel structures involves planning of structures, proportioning of members of structures for carrying load in an economical manner.**

COURSE OUTCOMES AND INTENDED LEARNING OUTCOMES

Subject: Design of Steel Structures
Code: CV-603

COURSE OBJECTIVES	**INTENDED LEARNING OUTCOMES** (***After attending the course the students will be able to***…….)	Associated Skill
To make the students understand about structural steel and relevant code of practice	State properties of structural steel .	remember
	Give examples of structural steel.	understand
	Use steel tables for section properties of structural steel.	Apply
	Identify and compute loads in structure as per relevant code of practice.	remember
To develop the concept of Limit State Design in steel design	Define each types of Limit States	remember
	List the points of difference s between LSD and WSM design	remember
	explain the FOS adopted for Material and Loads	understand
	Asses the characteristic strength and characteristic loads.	evaluate
	Describe the various methods of structural analysis	understand
To familiarize with rivets and analysis of riveted joint	State the types of rivets.	remember
	Describe the failure of Riveted joint.	understand
	Show the types of arrangement of rivets in joint.	apply
	Calculate strength and efficiency of riveted joints	apply
	Design riveted joints for given loads.	create
To develop concept of bolted joint.	State the types of bolts.	remember
	Describe the advantage and disadvantage of bolted joint.	understand
	Show the types of arrangement of bolts in joint.	apply
	Describe the failure of bolted joint	understand
	Calculate strength and efficiency of bolted joints	apply
	Design bolted joints for given loads	create
	Detail the bolted connection in sheets.	create
Ability to perform	Differentiate frame and seated connection.	understand

bolted frame and seated connection for steel structures.	Analyze and design of bolted frame connection for beam column and beam - beam connection.	create
	Analyze and design of bolted unstiffened seated connection for beam column connection.	create
To be able to perform analysis and design of welded connection design.	State advantage and disadvantage of welded joint.	remember
	Describe the types welds.	understand
	Apply design considerations for welded joint as per IS 800-2007	Analyze
	Analyze and design welded joint subjected to axial load	Analyze
	Apply fillet weld for beam-column connection.	Analyze
Ability to design and draw tension member	Identify steel sections for tension member	Understand
	State factors affecting design of tension member	Remember
	Describe the failure modes for tension member	Understand
	Analyze and design of tension member simple types	Analyze
	Detail tension member for bolted and welded connection.	Apply
Ability to analyze , design and draw compression member.	Classify compression member depending on slenderness ratio.	Analyze
	Describe the failure modes for compressive member	understand
	Explain the failure modes of compression member.	analyze
	Design compression member for axially loaded member.	Analyze, create
To be able to design simple steel beams.	Illustrate the types of steel beams.	understand
	Classify beam cross sections	Apply
	List factors affecting lateral stability of beam	remember
	Describe the failure modes of beams	Understand
	Determine bending strength of laterally supported beam.	Apply
To understand the use of column bases and their design technique.	Name the types of column bases.	Remember
	Apply codal provisions for minimum thickness and effective area of column base.	Apply
	Design and analyze slab base and gusseted base plate for axial loads only.	Analyze ,create
	Sketch column bases as per design data.	create

5. Teaching Scheme (In hours/week) Total Contact hr.= 60

Lecture	Tutorial	Practical	Total
4 hrs./week	1	--	5 hrs

6.**Examination Scheme**

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

7.**Detailed of Course Content:**

Chapter No.	Chapter Title	Content	Duration (Hrs.)
1.	**Introduction to steel structure:**		2
		Advantage and disadvantage of steel structure as construction material, types of structural steel- mild steel, medium carbon steel, high carbon steel, low alloy steel and high alloy steel. Types of rolled steel sections with geometric shape, Grade of steel (IS:2060). Use of steel tables. Types of load and load combinations as per IS 875-1987. Familiarization with IS:800-2007	
2.	**Design considerations(IS:800-2007)**		3
		Philosophy of Limit state method of design, Characteristic loads, partial safety factors, characteristic strength, Design strength. Limit state of serviceability, forms of structural stability Deflection limit, vibration limit, Durability consideration, fire resistance, Various Methods of structural analysis (brief descriptions only)	
3.	**Riveted Connections**		8
		Rivets-their types, definition and terms used in riveting, riveted joints, failure of riveted joint, strength of riveted joint, rivet value, efficiency of riveted joint, design of riveted joint (simple problems)	
4.	**Bolted Connections**		8
	4.1	Bolts- their types, advantages and disadvantages of bolted connections, definition and terms used in bolt and bolting, failure of bolted connections, Efficiency. Type of joints. Lap and Butt Joint. Arrangement of bolts in connections, Simple problems using Limit State method.	
5.	**Simple beam connections**		4
	5.1	Framed connections-beam to beam connections, Beam column connections: Seated connections. Simple problems using Limit State method.(Bolted connection only)	
6.	**Welded connections**		5
		Welding- different types and properties of welds, advantage and Disadvantage of welded connection	

		, welding processes, weld specifications, Calculation of strength of welded joints using LSM, Design of fillet weld for symmetrical and unsymmetrical sections for axial load only	
7.	**Design of tension members**		7
		Definition of tension members, types, factors affecting Strength of tension members, lug angles, Design of tension member using bolted and welded connections.(simple problems only)	
8.	**Design of compression members**		7
		Definition, classification of compression members- long, short and intermediate, slender compression members, sections used for compression members, loads on compression members, possible failure modes, Effective length and effective cross sectional area, Modes of failure of axially loaded compression member. Limit of slenderness ratio. Design of compression members.(for axially loads only)	
9.	**Design of beams**		5
		Types of beams, lateral stability of beams, factors affecting lateral stability, effective length, buckling, bending, maximum deflection, design of beams.	
10.	**Design of column bases**		5
		Types of column bases ,slab bases and gusseted base plate, Code provision (IS:800-2007) minimum thickness and effective thickness and effective area of base plate, Design of Slab base plate using bolt for axial loads only. (No problems on Gusseted base design)	
11.	**Class test and Seminar : Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.**		6

8.Distribution of Marks/ Table of specifications

Chapter No.	Chapter Title	Type of question		Total Marks
		Objective type (Compulsory)	Short/Descriptive Questions	
1.	Introduction to steel structure	3	--	3
2.	Design considerations(IS:800-2007)	4	--	4
3,4 &6	Connections : Riveted , Bolted and	5	11	16

	welded			
5.	Simple beam connections	3	11	14
7& 8	Design of tension members and compression members	5	11	16
9 & 10	Design of beams and column bases	5	12	17
	Total	25	45	70

9.Table of Specification for Theory Design of Steel Structure (CV-601)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction to steel structure	2	4	3	2		-
2	Design considerations	3	5	1	4		-
3	Riveted connections	8	13	3	2		-
4	Bolted connections	8	13	1	2	3	-
5	Simple beam connections	4	7	1	3	4	-
6	Welded connections	5	8	1	2	5	-
7	Design of tension members	7	12	1	2	5	-
8	Design of Compression members	7	12	1			6
9	Design of beams	5	8	1	2		6
10	Design of column bases	5	8	1	2	6	
11	Internal assessment	6	10	-	-	-	-
		∑b=54 hrs.+ 6hrs internal assessment	100	14	21	23	12

10.Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	***T***	K	C	A	HA	***T***
1	Introduction to steel structure	1			***1***	2	2			***4***
2	Design considerations	1	2		***3***		2			***2***
3	Riveted connections	1	2		***3***	2				***2***

4	Bolted connections	1	2		***3***			3		***3***
5	Simple beam connections	1	1		***2***		2	4		***6***
6	Welded connections	1	2		***3***			5		***5***
7	Design of tension members	1	2		***3***			5		***5***
8	Design of Compression members	1			***1***				6	***6***
9	Design of beams	1	2		***3***				6	***6***
10	Design of column bases	1	2		***3***			6		***6***
	Total				***25***					***45***

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11.Suggested Implementation Strategies:-

a) All the design should be in Limit state method.
b) The structural detailing should be drawn in the answer script itself (No need of separate drawing sheet).
c) The duration of each class should not be more than 2hrs.

12.Suggested Learning Resource: -

Teacher will use Black board, OHP, Smart board, video etc. for effective teaching learning process. Models of various rolled steel section should be shown for better understanding and concept.

RECOMMENDED BOOKS

1. Dr. N. Subramanian "Design of Steel Structures", Oxford University Press.
2. K. S. Sai Ram "Design of Steel Structures" Pearson-Porling Kindersley Pvt Ltd
3. M. R. Shiyekar "Limit State Design in Structural Steel", PHI Learning Pvt Ltd, 2011
4. S. Ramamrutham " Design of Steel structures" DhanpatRai publishing House.
5. Dr. Ramchandra&Gahlot- Design of Steel Structures
6. IS:800-2007, IS:875,
7. Steel Tables

Question Pattern

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

Optional questions (if any) may be from the same topic as below

Q: Design a tension member

Or

Design a compression member

(***Answer should be done only on answer script. No drawing sheet shall be supplied. Exam should be conducted in Class room instead of drawing hall)***

XXXXXXXXXXXXXXXXX

5:Course Title :- PROJECT & SEMINAR

1. **Contact hrs. :- Tutorial 45 hrs. + Practical 45 hrs.**
2. **Course Code :- CV-611**
3. **Semester :- 6th (Civil)**
4. **Objective of the Subject/ Courses :-**

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

- Collect the information for a given project.
- Apply principles, theorems and bye-laws in the project planning and design.
- Interpret and analyze the data.
- Develop professional abilities such as persuasion, confidence, and perseverance and Communication skill.
- Develop presentation skill.
- Enhance creative thinking.

PROJECT & SEMINAR (CV-611) 6th SEM

(CO)COURSE OUTCOME)

Diploma in civil Engineering Students will be able to:

- **CO-1**: To collect information for a given project.
- **CO-2**: To apply principles, theorems and bye-laws in the project planning and design.
- **CO-3**: To interpret and analyze the data.
- **CO-4**: To develop professional abilities such as persuasion, confidence, and perseverance and communication skill.
- **CO-5**: To develop presentation skill.
- **CO-6:** To enhance creative thinking.

INTENTED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes/ Topics	Indented Learning
1.	Intellectual skills	1. To decide and collect data for projects. 2. To read and interpret the drawing, data. 3. To design the components. 4. To apply the principles rules regulations and byelaws.

2.	Motor skills	1. To plan different phases of a task. 2. To prepare drawings for projects. 3. To use of computer for drawing, networking. 4. To work in a group for a given task.
3.	Project work	1. To collect data related to the project work 2. To develop team spirit 3. To write a complete project work 4. To develop confidence and communication skill 5. To draw conclusion and report writting

Pre-Requisite :-

1. Students should have entire knowledge of civil engineering.

5. Teaching Scheme (in hours/week) Total contact hours : Tutorial 60 hrs +Practical 60 hrs

Lecture	Tutorial	Practical	Total
		6	6

6. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
				100	50	50	150	3

7. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
				100	50	50	150	3

Project:
Skills to be developed:

INTELLECTUAL SKILLS:
1) Decide and collect data for projects.
2) Read and interpret the drawing, data.
3) Design the components.
4) Apply the principles rules regulations and byelaws.

MOTOR SKILLS:
1) Plan for different phases of a task.
2) Prepare drawings for project.
3) Use of computer for drawing, networking.
4) Work in a group for a given task.

LIST OF PROJECTS*:*

Following is the list /areas of suggested civil engineering projects to be undertaken by a group of 4 to 6 students . A topic for project can be selected on appropriate civil engineering subject or recent development in civil engineering.
The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

LIST OF CIVIL ENGINEERNG PROJECTS:
1) K.T. Weir
2) Lift Irrigation scheme.
3) Micro irrigation –Drip/Sprinkler Irrigation.
4) Junction planning for city roads/planning for roads for congested area/parking Studies etc.
5) Water shed development of small catchments.
6) Rain water harvesting for domestic or public building.
7) Campus development.
8) Interior decoration.
9) Concrete mix design.
10) Bridge design.
11) NDT of any RCC building.
12) Solid waste management.
13) Hospital waste disposal.
14) Recycling of resources.
15) Manufacturing of Pre cast concrete products.
16) Prestressed concrete.
17) Non conventional sources of energy.
18) Concrete pipe manufacturing unit.

19) Advance construction techniques.
20) Transfer of technology to villages.
21) Planning and design for residential apartments/commercial complex.
22) Planning and design of water treatment plant for given data.
23) Planning and design of water supply scheme for given lay out.
24) Planning and design of sewage treatment plant for given data.
25) Planning and design of sanitary scheme for given lay out.
26) ***Any other similar project can be selected.***

The Project Group and the faculty guide should be constituted at the beginning of 5th semester and initial work may be started at the 5th semester itself though the final project report has to be submitted at the end of 6th semester. The Project work must be reviewed twice in the same semester. On the basis of performance of students teacher/ guide/team of teacher will evaluate.

XXXXXXXXXXXXXXXXXXXX

6:Course Title :- PROFESSIONAL PRACTICE-IV

1. **Course Code :- Cv-610**
2. **Semester :- 6th (Civil)**
3. **Rationale of the Subject/ Courses :-**

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Course objectives (CO)

The Student will be able to:

p) Acquire information from different sources.
q) Prepare notes for given topic.
r) Present given topic in a seminar.
s) Interact with peers to share thoughts.
t) Prepare a report on industrial visit, expert lecture.

INTENTED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes/ topic/ activities	Indented Learning
1.	CO-1: Industrial and site visit.	Structured industrial visit and site visit shall be arranged and report of the same should be submitted by individual student) 1. Nearby steel structure under construction. 2. Nearby railway bridge under construction. 3. Nearby tunnel under construction. 4. Nearby mega water treatment plant. 5. Nearby multi-storied flat under construction. 6. Any other nearby industry related civil engineering.
2.	CO-2:Guest lectures	Lectures by professional or industrial expert or Student seminars based on information search to be organized from any two the following areas: 1. Entrepreneurship. 2. Self-motivation and career counselling. 3. How to face interview. 4. Building repair and maintenance. 5. CPM and PERT. 6. Any other relevant topic related to civil engineering.

3.	CO-3: Information search	Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested- 1. Job opportunities in different organization. 2. Scope for further higher studies. 3. Maintenance of building 4. Environmental monitoring system. 5. Design of water treatment plant. 6. Design of irrigation project. 7. Construction of tunnel. 8. Any other topic suggested by teacher.
4.	CO-4: Student activities and seminar	The Students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar. 1. Visit of an old RCC building to observe defects and to suggest remedial measures. 2. Visit of an nearby factory or industry to study the management system. 3. Visit of the nearby town or city to study the sewage disposal system. 4. Collection of water samples from different sources to study the quality of drinking water. 5. Visiting of a nearby railway station for preparing a report on the station. 6. Any other relevant field selected by teacher.

4. Teaching Scheme (in hours/week) **Total contact hours : 30 hrs.**

Lecture	Tutorial	Practical	Total
		2	2

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (PT+ PA)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
---	---	---	-----	25	25	17/50	50	

7.Detail course content

UNIT	TOPIC/ACTIVITIES	CONTACT HRS
1	Industrial and site visit : Structured industrial visit and site visit shall be arranged and report of the same should be submitted by individual student (Any two of the following) 1.17 Nearby Steel structure under construction 1.18 Nearby Railway bridge under construction 1.19 Nearby Tunnel under construction 1.20 Nearby Mega Water treatment plant 1.21 Nearby multi -storied flat under construction 1.22 Any other nearby industry related Civil Engineering.	10
2	Guest Lectures : Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any TWO of the following areas: 2.1 Entrepreneurship 2.2 Self-motivation and career counselling 2.3 How to face interview 2.4 Building repair and maintenance 2.5 CPM and PERT 2.6 Any other relevant topic related to Civil Engineering	6
3	Information search : Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report **any one** topic. Following topics are suggested r) **Job opportunities in different organization** s) Scope for further higher studies t) Maintenance of building u) Environmental monitoring system v) Design of Water treatment plant w) Design of irrigation project x) Construction of tunnel y) Any other topic suggested by teacher	6
4	Student Activities and Seminar : The students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar 4.16 Visit of an old RCC building to observe defects and to suggest remedial measures 4.17 Visit of an nearby factory or industry to study the management system 4.18 Visit of the nearby town or city to study the sewage disposal system	8

	4.19 Collection of water samples from different sources to study the quality of drinking water. 4.20 Visiting of a nearby railway station for preparing a report on the station. 4.21 Any other relevant field selected by teachers	

XXXXXXXXXXXXXXXXXXXXXXXXXX

7: Course Title :- BUILDING REPAIR & MAINTENANCE (Optional)

1. **Course Code :- CV-604**
2. **Semester :- 6th (Civil)**
3. **COURSE OUTCOME (CO)**

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

* Diagnosis the defect of the building
*Identify the causes of defect
* Apply common technique of repair
*Repair RCC element
*Apply common strengthening procedure to the structure

COURSE OUTCOMES AND INTENDED LEARNING OUTCOMES

Course Outcome	Intended Learning Outcomes
CO1-Define the Importance of maintenance, Find out the factors influencing maintenance,	ILOs 1.Define the maintenance 2. State the objectives of maintenance. 3. State the importance of maintenance. 4. State the factors influencing maintenance. 5. State the Life of building.
CO2-State the process of deterioration. Classify the deterioration of buildings. Find out the factors of deterioration. Effect of deterioration on bricks, timber, concrete , paints, glass and plastics.	ILOS 1. State the process of deterioration. 2. Classify the deterioration. 3. List out the process of deterioration. 4. Factors of deterioration. 5.Effect of deterioration on bricks. Timber, concrete, paints , glass and plastics.
CO3-Apply steps for investigation. Objectives of investigation. Sources of information. Investigation kits for diagnosis. List out NDT instruments. Find out causes and symptoms o deterioration.	1. State the objectives of investigation. 2. State the steps for investigation. 3.State the purposes of investigation. 4. Find out the Sources of information. 5. Visual Examination. 6. Investigation kit for diagnosis. 7.Listout Non destructive tests instruments. 8. State the merits and demerits of NDT. 9. Uses of NDT. 10. Find the causes and symptoms of deterioration. 11. Causes of defects in foundation , DPC, wall , plaster , columns , Beams, Roofs , R.C.C , paints.

CO4 - Characteristics of repair materials. Find out the factors for selection of materials for repairs. Types of repair materials. Select the commercially available materials for repair.	ILOs 1. State characteristics of repair materials. 2. Find out the factors of materials for repairs. 3. Types of repair materials. 4. Select the commercially available materials for repair.
CO5 - Know the importance of surface preparation. Methods of surface preparation. State the common repair techniques. Common methods of cracks repair. Repair of existing water proofing of flat roof.	ILOs 1.State the importance of surface preparation. 2. State the methods of surface preparation. 3. State the common repair techniques. 4. State the common methods of crack repair. 5. Repairs of existing water proofing of flat roof. 6. State the steps and techniques used in water proofing flat roof by Mudphuska, Lime Terrace and Ferro cement.
CO6 - List out prevention of corrosion in reinforcement. Preparation of RCC for repair. Repair of corroded RCC elements. List out Concrete placement Techniques. Repair of surface defects.	ILOs 1. List out the prevention of corrosion in reinforcement. 2.Preparation of RCC for repair. 3. Repair of corroded RCC elements. 4. List out concrete placement Techniques. 5. repair of surface defects.
CO7 - Stabilization of foundations. Underpinning. Repair of raft slab foundations. Repair of DPC against rising dampness.	ILOs 1. Stabilization of foundations. 2. Underpinning. 3. Foundation support. 4. Repair of raft slab foundations- Edge settlement, interior slab heaving, upheaval. 5. Repair of DPC against rising dampness.
CO8 - State the Importance of finishing. List of repair of mortar joints. Efflorescence of removal.	ILOs 1. State the Importance of finishing. 2. List out repair of mortar joints. 3. Efflorescence of Removal. 4. List out Decorative coatings. 5. Repair of plastering. 6. Repair of paints. 7. Common defects in concrete floors.
CO9 - State the common problems in water supply and sanitary systems. Maintenance of pipes. Repair of Taps. Repairing of WC cisterns. Cleaning of clogged drains. Common defects in overhead and underground water tanks.	ILOs 1.State the common problems in water supply and sanitary systems. 2. Maintenance of pipes. 3. Repair of Taps. 4. Repairing of WC cisterns. 5. Cleaning of clogged drains. 6. Find the common defects in overhead and underground water tanks.

4. Teaching Scheme (in hours/week) **Total contact hours : Lecture 45 hrs.**
Tutorial 15 hrs.

Lecture	Tutorial	Practical	Total
3	1		4

5. Examination Scheme :

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	

6. Detailed Course Content

Chapter no	Chapter Title	Content	Duration (Hrs.)
1	Introduction	**6.1 Introduction of building** 6.2 Importance of maintenance 6.3 Definition of maintenance 1.4 Objectives of maintenance 1.5 Factors influencing maintenance 1.6 Life of buildings-physical, functional and economical life.	3
2	**Deterioration of buildings**	2.1 Process of deterioration 2.2 Classification of deterioration 2.3 Factors of deterioration 2.4 Effect of deterioration on-Bricks, Timber, concrete, Paints, Glass and plastics.	4
3	**Investigation and Diagnosis of defects in buildings**	3.1 Steps for investigation 3.2 Objectives of investigations 3.3 purposes of investigations 3.4 Sources of information 3.5 Visual Examinations 3.6 Investigation Kits for diagnosis 3.7 Non destructive tests- purposes and lists of NDT instruments, merits and demerits & their uses. 3.8 Causes and Symptoms of deterioration 3.9 Causes of Defects in foundations, DPC, Walls, plaster, columns, Beams, Roofs, RCC, paints.	9

4	**Materials for repair**	4.1 Characteristics of repair materials 4.2 Factors for Selection of materials for repairs 4.3 Types of repair materials with examples. 4.4 Commercially available repair materials (name only) for rebar primer, Curing compounds, Joint Sealants, protective coatings, Water proofing.	3
5	**Common Techniques of Building repairs**	5.1 Importance of Surface preparation 5.2 Methods of Surface preparation 5.3 Common repair techniques (brief description only) 5.4 Common methods of Crack repair (brief description only) 5.5 Repairs of existing water proofing of flat roof 5.6 Steps and techniques used in water proofing flat roof by Mud phuska, Lime Terrace and Ferro cement.	5
6	**Repair of RCC Elements**	6.1 Prevention of corrosion in reinforcement (list only) 6.2 Preparation of RCC for repair 6.3 Repair of Corroded RCC elements. 6.4 Concrete Placement Techniques(list only) 6.5 Repair of Surface defects.	5
7	**Repair and Maintenance of Foundations and DPC**	7.1 Stabilization of foundations 7.2 Underpinning 7.3 Foundation Support 7.4 Repair of raft slab foundations- Edge settlement, Interior slab heaving, Edge Upheaval. 7.5 Repair of DPC against rising dampness.	4
8	Repair **of finishes**	8.1 Importance of finishing 8.2 List of repair of mortar joints. 8.3 Efflorescence Removal 8.4 Decorative Coatings(list only) 8.5 Repair of Plastering 8.6 Repair of Paint 8.7 Common defects in concrete floors	4
9	**Repair of Water Supply and Sanitary System**	9.1 Common Problems in water supply and Sanitary system 9.2 maintenance of Pipes 9.3 Repairs of Taps 9.4 Repairing of WC Cisterns 9.5 Cleaning of clogged drains 9.6 Common defects in overhead and underground water tanks.	4

10	**Common Strengthening Techniques**	10.1 Importance of Strengthening 10.2 Basic Techniques.	2
11	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	8

7. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question			Total Marks
		Objective Type (Compulsory)	Short Questions	Descriptive Questions	
N.B:- At least 5 marks question shall be asked from each chapter.					

9.Table of Specification for BUILDING REPAIR & MAINTENANCE :

Sl. no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	3	6	1	4	-	-
2	Deterioration of buildings	4	8	1	4	-	-
3	Investigation and Diagnosis of defects in buildings	9	20	4	9	-	-
4	Materials for repair	3	6	1	4	-	-
5	Common Techniques of Building repairs	5	10	1	7	-	-
6	Repair of RCC Elements	5	10	1	7	-	-

7	Repair and Maintenance of Foundations and DPC	4	8	1	7	-	-
8	Repair of finishes	4	8	1	6	-	-
9	Repair of Water Supply and Sanitary System	4	8	1	6	-	-
10	Common Strengthening Techniques	2	4	1	3	-	-
11	Internal assessment	6	12	-	-	-	-
		∑b=49 hrs.+ 6hrs internal assessment	100	13	57		

10.Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	***T***	K	C	A	HA	***T***
1	Introduction	1	1		***2***		3	-	-	**-**
2	Deterioration of buildings	1	1		***2***		3	-	-	**-**
3	Investigation and Diagnosis of defects in buildings	2	2		***4***	2	7	-	-	**-**
4	Materials for repair	1	1		***2***		3	-	-	**-**
5	Common Techniques of Building repairs	1	2		***3***		5	-	-	**-**
6	Repair of RCC Elements	1	2		***3***		5	-	-	**-**
7	Repair and Maintenance of Foundations and DPC	1	2		***3***		5	-	-	**-**
8	Repair of finishes	1	1		***2***		5	-	-	**-**
9	Repair of Water Supply and Sanitary System	1	1		***2***		5	-	-	**-**
10	Common Strengthening Techniques	1	1		***2***		2	-	-	**-**
	Total				***25***					***45***

K = knowledge; C= comprehension; A= Application; HA= Higher than application

8. Suggested Implementation Strategies:- The short question should carry 3 marks per question and descriptive question may carry minimum 5 marks and maximum 10 marks per question. Objective type question will carry 1 mark per question and it shall be of very short type or multiple choice or fill up the gap type.
9. Suggested Learning Resource :-

9.1 Book list

REFERENCE BOOKS-

I) P.S. GAHLOT & SANJAY SHARMA-Building Repair and Maintenance Management.

ii) A.C. PANCHDARI-Maintenance of Buildings

iii) National building agency-Common Building defects.

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7:Course Title :- BUILDING REPAIR & MAINTENANCE (Optional) (PRACTICAL)

1. **Course Code :- CV-604**
2. **Semester :- 6th (Civil)**

Practical :

Skills to be developed:

INTELLECTUAL SKILLS:

1. Identify the method for testing of strength of a building
2. Identify the method for repairing and maintenance of the structure
3. Diagnosis the defect of the structure

MOTOR SKILLS:

1. Observe results carefully
2. Handle instruments carefully.

List of Practical:

1. **Determination of strength of concrete by rebound hammer**
2. **Determination of Concrete cover on reinforcement by cover meter**
3. **Use and handling of rebar locator**
4. **Determination of quality of Concrete by chemical reagent**
5. **Determination of strength of concrete by UPV method**
6. **Use and handling of any other NDT equipment.**

OR

Preparation of a mini project report related to

1. **Building repair and maintenance**
2. **Retrofitting of structures**
3. **Repair and maintenance of water supply and sanitary system**
4. **Diagnosis the defects of some nearby RCC building**
5. **Any other related topic suggested by concerned teachers**

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8: Course Title :- RAILWAY BRIDGE & TUNNEL ENGINEERING (Optional)

1. **Course Code :- CV-605**
2. **Semester :- 6th (Civil)**
3. **Objective of the Subject/ Courses :-**
   On completion of the course, the student will be able to:

a) Explain the various stages of work for Railway alignment.
b) Identify and use components of Rail.
c) Organize and supervise laying of rail track.
d) Select ideal site for Bridge and carry out their maintenance.
e) Use drilling Equipment.
f) Practice safety in drilling operation.

5.Course Outcomes of Railway Bridge and Tunnel Engineering (Theory).

Sr. No.	Course Outcomes	Intended Learning
1.	CO1- Define the Role of Railway Transportation in the development on nation. State the Modes of Transformation systems. State the importance of each mode and comparison of each mode. State the merits and demerits of each mode.	ILOs- 1.Define the Role of Railway Transportation in the development of nation. 2. State the modes of Transportation system. 3. State the importance of each mode of transportation. 4. Comparison of each mode. 5. State the merits and demerits of each mode. 6. State the necessity and importance of Cross drainage works in railways.
2.	CO2 – Classify Indian Railways. State the zones of Indian Railway. Factors governing rail alignment. Types of Gauges. Factors affecting selection of gauges. Rail Track cross sections. Rails function and types. Rail joints – requirements , types of joints. Sleepers – functions and requirement and types of sleepers. Railway Track Geometrics.	ILO2- 1. Classify the Indian Railways. 2. State the zones of Indian Railway. 3. Factors governing rail alignment. 4. State the types of Gauges. 5. List out Factors affecting selection of gauge. 6. Find the Rail Track cross –sections. 7. Describe the functions of Rails. 8. Describe the types of Rails. 9. Describe the Rail joints. 10. State the functions and requirement of Sleepers. 11. State the types of sleepers. 12. State the Ballast function and types with their properties. 13. State the Rail fixtures and fastenings. 14. Railway Track Geometrics. 15. Define the point and crossing. 16. Sketch of different components of points and crossing lines.

	Branching of Tracks. Station and yards. Track Maintenance.	17. Inspection of points and crossings. 18. Selection of site for Railway Stations. 19. Find the requirement of railway station. 20. State the types of Stations. 21. State the types of station yard. 22. Find the necessity of Track Maintenance. 23. Types of Tools required for Maintenance.
3.	CO3- Site Selection and Investigation of a Bridge . Collection of Design data. Classify bridges. Draw the plan and sectional elevation of bridge showing component parts of substructure and super structure. Define permanent and Temporary bridges. Inspection of Bridges. Maintenance of Bridges.	ILOs- 1.State the factors affecting selection of site of a bridge. 2. Find bridge alignment. 3. Collect design data. 4. Classify bridges according to function , material , span , size , alignment , position of HFL. 5. Draw the plan and sectional elevation of bridge showing component parts of substructure and super structure. 6. State the function and types of foundation of bridges. 7. State the function and types of abutment. 8. State the function and types of wing walls. 9. State the function and types of bearing for RCC and steel bridges. 10. Sketch of culverts , permanent bridges. 11. Temporary bridges. 12. Inspection of bridges. 13. Maintenance of bridges .
4.	CO4- Define Tunnels. Classify Tunnels. Tunnel cross sections for highway and railways. Investigation and surveying. Shaft construction and its purpose. Methods of Tunneling in soft rock-needle beam method. Methods of tunneling in hard rock-full – face heading method. Precautions in construction of tunnels. Drilling equipment. Types of explosives used in tunneling. Tunnel lining and ventilation.	ILOs- 1. Define Tunnels. 2. Find necessity of Tunnels. 3. State the advantages and disadvantages of tunnels. 4. Classify tunnels. Find the shape and size of tunnels. 5. Tunnel cross sections for highway and railways. 6. Investigation and surveying for tunnels. 7. Describe shaft construction and its purpose. 8. Describe the tunneling in soft rock – needle beam methods. 9. Describe the tunneling in hard rock – full – face heading methods. 10. Bench method and Drift method. 11. Take precautions in construction of tunnels. 12. Describe the drills and drilling equipment. 13. Types of explosives used in tunneling. 14. Define tunnel lining and ventilation.

5.Teaching Scheme (in hours/week) **Total contact hours : Lecture 45 hrs. Tutorial 15 hrs**

Lecture	Tutorial	Practical	Total
3		3	4

6.Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

7.Course Content

Unit	Topic	Contact hr
1	Overview of Transportation Engineering 1.1 Role of Railway transportation in the development of nation. 1.2 Modes of transportation system – roads, railway, airways, waterways, Importance of each mode, comparison and their relative merits and demerits. 1.3 Necessity & importance of Cross drainage works in railways.	2
2	Railway Engineering. 2.1 Alignment and Gauges, Classification of Indian Railways, zones of Indian Railway. Alignment- Factors governing rail alignment. Gauges – types, factors affecting selection of gauge. Rail track cross sections – standard cross section of BG & M.G Single & double line in cutting and embankment. 2.2 Permanent ways Ideal requirement, component parts. Rails – function & its types. Rail Joints – requirements, types, Creep of rail , causes & prevention of creep. Sleepers – functions & Requirement, types – wooden, metal, concrete sleepers their suitability, sleeper density. Ballast – function & different types with their properties, relative merits & demerits. Rail fixtures & fastenings – fish plate, bearing plates, spikes, bolts, keys, anchors & anti creepers. 2.3 Railway Track Geometrics. Coning of wheels, tilting of rails, Gradient & its types, Super elevation, Limits of Super elevation on curves, cant deficiency negative cant, grade compensation on curves. 2.4 Branching of Tracks Definition of point & crossing, a simple split switch turnout consisting of points and crossing lines Sketch showing different components, their functions & working.	18

	Line sketches of track junctions-crossovers, Scissor cross over, Diamond crossing, triangle. Inspection of points and crossings 2.5 Station and Yards : Site selection for railway stations, Requirements of railway station, Types of stations (way side, crossing, junction & terminal), Station yards , types of station yard, Passenger yards, Goods yard, Locomotive yard – its requirements, water column , Marshalling yard – its types. 2.6 Track Maintenance- Necessity, types, Tools required and their function, organization, duties of permanent way inspector, gang mate, key man	
3	Bridge Engineering : 3.1 Site selection and investigation Factors affecting selection of site of a bridge. Bridge alignment, Collection of design data Classification of bridges according to function, material, span, size, alignment, position of HFL. 3.2 Component parts of bridge. Plan & sectional elevation of bridge showing component parts of substructure & super structure. Different terminology such as effective span, clear span, economical span, waterway, afflux, scour, HFL, freeboard, etc. Foundation – function, types, Piers-function, requirements, types. Abutment – function, types Wing walls – functions and types. Bearing – functions, types of bearing for RCC & steel bridges. Approaches –in cutting and embankment. Bridge flooring- open and solid floors 3.3 Permanent and Temporary Bridges- Permanent Bridges - Sketches & description in brief of culverts, causeways, masonry, steel, movable steel bridges, RCC girder bridge, Temporary Bridges- timber, flying, floating bridges 3.4 Inspection & Maintenance Of Bridge. Inspection of bridges, Maintenance of bridges & types – routine & special maintenance.	12
4	Tunnel Engineering. 4.1 Definition, necessity, advantages, disadvantages 4.2 Classification of tunnels. 4.3 Shape and Size of tunnels 4.4 Tunnel Cross sections for highway and railways 4.5 Tunnel investigations and surveying –Tunnel surveying locating	8

	center line on ground, transferring center line inside the tunnel. 4.6 Shaft - its purpose & construction. 4.7 Methods of tunneling in Soft rock-needle beam method, fore-poling method, line plate method, shield method. 4.8 Methods of tunneling in Hard rock-Full-face heading method, Heading and bench method, drift method. 4.9 Precautions in construction of tunnels 4.10 Drilling equipment-drills and drills carrying equipment 4.11 Types of explosives used in tunneling. 4.12 Tunnel lining and ventilation.	
5	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	6

7.Distribution of marks/ Table of specifications

Chapter No	Chapter Title	Type of Question			Total Marks
		Objective Type (Compulsory)	Short Questions	Descriptive Questions	
1	Overview of Transportation Engineering	1	3		4
2	Railway Engineering	1+1+1+1=4	6	20	30
3	Bridge Engineering	1+1+1=3	3	14	20
4	Tunnel Engineering	1+1=2	3	11	16
Total		10	15	45	70

9.Table of Specification for Theory Design of Steel Structure (CV-601)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Overview of Transportation Engineering	2	4	1	3		
2	Railway Engineering	18	40	7	7	16	
3	Bridge Engineering	12	26	3	7	10	
4	Tunnel Engineering	8	17	3	4	9	
11	Internal assessment	6	13	-	-	-	-
		∑b=46 hrs.+ 6hrs internal assessment	100	14	21	35	

10.Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	***T***	K	C	A	HA	***T***
1	Overview of Transportation Engineering	1	3		***4***					
2	Railway Engineering	2	2	6	***10***	5	5	10		***20***
3	Bridge Engineering	1	2	3	***6***	2	5	7		***14***
4	Tunnel Engineering	1	1	3	***5***	2	3	6		***11***
	Total				***25***					***45***

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11.Suggested Implementation Strategies :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process.

12.

Text Books: -

Titles of the Book	Name of author	Edition Name of the Publisher
Railway Engineering	S.C. Saxena	Dhanpatrai& sons
Railway Track	K.R. Antia	The New Book Co. Pvt. Ltd Mumbai
Principles of Railway Engineering	S.C. Rangwala	Charotar Publication
Principles and Practice of Bridge Engineering	S.P.Bindra	Dhanpatrai& sons
A Text Book of Transportation Engineering	L.Arora and S.P.Luthra	IPH New Delhi
Elements of Bridge Engineering	J.S. Alagia	Charotar Publication
Bridge Engineering	D.R. Phatak	Everest Publisher
Elements of Bridges	D. JohnosVicter	Oxford & IBH Publishing co.
Road, Railway and Bridges	Birdi& Ahuja.	Std. Book House
Tunnel Engineering	S.C. Saxena	Dhanpatrai& sons
Explosive Engineering	C. B. Navalkar	--

IS / International Codes. : IS 4880, I.S. 5878, Part-I to X.

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8.Course Title :- RAILWAY BRIDGE & TUNNEL ENGINEERING (Optional) (PRACTICAL)

1. **Course Code :- CV-605**
2. **Semester :- 6th (Civil)**

Practical :

Skills to be developed:

INTELLECTUAL SKILLS:

1. Identify the method for testing of materials related to Road, Bridge and Tunnel
2. Identify the method for repairing and maintenance of bridge and tunnel
3. Diagnosis the defect of the structure

MOTOR SKILLS:

1. Observe results carefully
2. Handle instruments carefully.

List of practical

1. Determination of Abrasion value of ballast and stone
2. Determination of impact value of stone.
3. Determination of CBR value of soil in the laboratory
4. Determination of CBR value of soil in the field
5. Determination of field density of soil by core cutter method
6. Determination of water content of soil in the field

Or

Preparation of a mini project report related to

1. **Railway bridge**
2. **Ideal railway station**
3. **Geometric design of railway track**
4. **Construction of tunnel**
5. **Inspection and maintenance of tunnel**
6. **Any other related topic suggested by concerned teachers**

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Remarks

7. The proposed syllabus is the outcome of team work
8. The proposed syllabus has been prepared as per the instructions obtained from the higher authority time to time.

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