GOVT. COLLEGE OF ENGINEERING, AMRAVATI

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM
of
FINAL YEAR
B. TECH. (Civil Engineering)
Finalised after APEC meeting

2022- 23

Program Outcomes:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

PSO1. Identify Civil Engineering related real life issues/ problems in industries, society and provide feasible solution

PSO2. Apply the knowledge of the basic streams of Civil Engineering viz. Building Construction, Transportation Engineering, Environmental Engineering and Irrigation Engineering (Water Resources Engineering) to design Civil Engineering Structures

PSO3. Plan and implement the activities in the Civil Engineering Project as a part of team or as an individual

B. Tech. (Civil Engineering)

SEM -III														
Category			**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory			**Practical**		**Total**		
	Course Code	**Name of the Course**	**Theory Hrs /week**	**Tutorial Hrs/week**	**Practical Hrs/week**	**Total**	**MSE**	**TA**	**ESE**	**ICA**	**ESE**			
Basic Science Course	SHU321A SHU 322A	Differential Equations and Probability *Integral Calculus and Probability	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU321	Fluid Mechanics	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU322	Building Materials and Construction	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU323	Solid Mechanics	3	-	-	3	30	10	60	-	-	100		3
Mandatory courses (noncredit)	SHU323	Introduction to Constitution of India	1	-	-	-	-	20	30	-	-	50		0
Professional Core courses	CEU324	Engineering Geology	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU325	Building Materials and Construction Lab	-	-	2	2	-	-	-	25	25	50		1
Professional Core courses	CEU326	Engineering Geology Lab	-	-	2	2	-	-	-	25	25	50		1
Professional Core courses	CEU327	Solid Mechanics Lab	-	-	2	2	-	-	-	25	25	50		1
	Total		**16**	**00**	**06**	**21**	**150**	**70**	**330**	**75**	**75**	**700**		**18**

**For Direct Second Year Admitted Students*

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM -IV

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core courses	CEU421	Hydraulic Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU422	Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU423	Transportation Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU424	Concrete Technology	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU425	Hydrology & Water Resources Engineering	3	-	-	3	30	10	60	-	-	100	3
Basic Science	SHU422	Environmental Study	1	-	-	-	-	20	30	-	-	50	0
Professional Core courses	CEU426	Hydraulic Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU427	Surveying Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU428	Transportation Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU429	Materials, Testing & Evaluation Lab	-	-	2	2	-	-	-	25	25	50	1
Basic Science	SHU425	Human Values and Ethics	1	-	-	1	-	20	30	-	-	50	0
	Total		**17**	**00**	**08**	**24**	**150**	**90**	**360**	**100**	**100**	**800**	**19**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM- V													
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**						**Credits**
							Theory			**Practical**		**Total**	
			Theory Hrs /week	**Tutorial Hrs/week**	**Practical Hrs/week**	**Total**	**MSE**	**TA**	**ESE**	**ICA**	**ESE**		
Professional Core Courses	CEU521	Theory of Structures	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU522	Geotechnical Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU523	Water Supply Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU524	Design of Steel Structures	3	-	-	3	30	10	60	-	-	100	3
Professional Core Course	CEU525	Advanced Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU526	Building Planning & Drawing	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU527	Geotechnical Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU528	Design of Steel Structures Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU529	Building Planning & Drawing Lab	-	-	4	4	-	-	-	25	25	50	2
Professional Core Courses	CEU530	Advanced Surveying Lab	-	-	2	2	-	-	-	25	25	50	1
	Total		**16**	**2**	**10**	**28**	**180**	**60**	**360**	**100**	**100**	**800**	**23**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs**except for CEU524, and CEU526 for which duration shall be 3.00 hours**

B. Tech. (Civil Engineering)

SEM - VI

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU621	Design of Reinforced Concrete Structures	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU622	Estimation & Costing	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU623	Program Elective – I	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU624	Program Elective – II	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU625	Environmental Pollution and Control	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU633*	Open Elective I	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU627	Design of Reinforced Concrete Structures Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU628	Estimation & Costing Lab	-	-	4	4	-	-	-	50	25	75	2
Professional Core Courses	CEU629	Environmental pollution and Control Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU630	Program Elective – II Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU631	Minor Project	-	-	2	2	-	-	-	25	-	25	1
	Total		**17**	**01**	**12**	**30**	**150**	**50**	**360**	**150**	**100**	**810**	**24**

*** to be offered for other Departments**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs**except for CEU621 AND CEU622 for which duration shall be 3.00 hours**

B. Tech. (Civil Engineering)

SEM - VII

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU721	Advanced Theory of Structures	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU722	Foundation Engineering	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU723	Program Elective – III	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU724	Program Elective IV	3	-	-	03	30	10	60	-	-	100	3
Open subjects	CEU733*	Open Elective II	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU726	Advanced Theory of Structures Lab	-	-	02	02	-	-	-	25	25	50	1
Professional Core Courses	CEU727	Foundation Engineering Lab	-	-	02	02	-	-	-	25	25	50	1
Professional Core Courses	CEU728	Civil Engineering Software Lab	-	-	04	04	-	-	-	50	-	50	2
Professional Core Courses	CEU729	Project – Phase I	-	-	04	04	-	-	-	100	-	100	2
Professional Core Courses	CEU730	Seminar	-	-	02	02	-	-	-	50	-	50	1
Professional Core Courses	CEU731	Industrial Training / Industrial Visit	-	-	-	-	-	-	-	25	-	25	1
		Total	**15**	**00**	**14**	**29**	**120**	**40**	**300**	**275**	**50**	**785**	**23**

*** to be offered to other Departments**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM - VIII													
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**						**Credits**
							Theory			**Practical**		**Total**	
			Theory Hrs /week	**Tutorial Hrs/week**	**Practical Hrs/week**	**Total**	**MSE**	**TA**	**ESE**	**ICA**	**ESE**		
Professional Core Courses	CEU821	Construction Engineering & Management	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU822	Program Elective V	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU823	Program Elective VI	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU824	*Project – Phase II	-	-	10	10	-	-	-	100	100	200	6
	Total		**09**	**00**	**10**	**19**	**90**	**30**	**180**	**100**	**100**	**500**	**15**

*A) Project Work in the Institute **OR** B) Industry Internship

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE I CEU623	**PROGRAM ELECTIVE II** CEU624	**PROGRAM ELECTIVE III** CEU723	**PROGRAM ELECTIVE IV** CEU724	**PROGRAM ELECTIVE V** CEU822	**PROGRAM ELECTIVE VI** CEU823
A. Structural Mechanics B. Reliability Analysis of Structures C. Geographic Information Systems and Science D. Railway, Tunnel & Airport Engineering E. Hydraulic Modelling	A. Advanced Design of Steel structures B. Advanced Concrete Technology C. Physico-Chemical Processes for Water Treatment D. Open Channel Flow E. Repairs, Rehabilitation &Retrofittingof structures	A. Computer Methods in Structural Analysis B. Masonry Structures C. Solid and Hazardous waste management D. Intelligent Transportation System E. Infrastructure Planning & Management	A. Structural Dynamics B. Prestressed Concrete C. Air and Noise pollution control D. Ground Improvement Technology E. Port, Harbour and Bridge Engineering	A. Finite Element Method B. Advanced Design of Concrete Structures C. Construction Project Planning & System D. Industrial Pollution and Control E. Advanced Foundation Engineering	A. Earthquake Resistant structures B. Industrial structures C. Design of Hydraulic Structures/Irrigation Engineering D. Pavement Design and Construction E. Geotechnical Investigation and Construction Practices F. Water Distribution Systems

LIST OF OPEN ELECTIVES

OPEN ELECTIVE I CEU633	**OPEN ELECTIVE II** CEU733
A. Introduction to Civil Engineering B. Project Management C. Construction Techniques	A. Industrial Building Planning & Design B. Interior Designing of Buildings C. Environmental Legislation D. Disaster Management

Equivalence of Final Yr. B. Tech Courses

As per Previous (old) structure			Equivalence As per Revised Structure w.e.f 2021-22		
Course Codes	**Name of Course**	**Credits**	**Course Codes**	**Name of Course**	**Credits**
VII Semester B. Tech					
CEU701	Advanced Theory of Structures	03	CEU721	Advanced Theory of Structures	03
CEU702	Foundation Engineering	03	CEU722	Foundation Engineering	03
CEU703(A)	Elective-I Advanced Structural Analysis	03	-	No equivalence	-
CEU703(B)	Elective-I Advanced Soil Mechanics	03	-	No equivalence	-
CEU703(C)	Elective-I Matrix Analysis of Structures	03	-	No equivalence	-
CEU703(D)	Elective-I Environmental Pollution Control	03	CEU702 (D)	Air and Noise pollution control	03
CEU703(E)	Elective-I (E) Railways, Tunnels & Airport Engineering	03	CEU623 (D)	Railway, Tunnel & Airport Engineering	03
CEU703(F)	Elective-I (F) Advanced Fluid Mechanics	03	CEU624 (D)	Program Elective II (D) Open Channel Flow	
CEU704(A)	Interdisciplinary Elective (A) Industrial Building Planning &Design	03	CEU725 (A)	Industrial Building Planning & Design	
CEU704(B)	Interdisciplinary Elective (B) Interior Designs AND Drawing	03	CEU725 (B)	Interior Designs and Drawing	
CEU704(C)	Interdisciplinary Elective (C) Project Management	03	CEU626 (B)	Project Management	03
CEU704(D)	Interdisciplinary Elective (D) Systems Engineering	03	-	No equivalence	-
CEU705	Advanced Theory of Structures Lab	01	CEU726	Advanced Theory of Structures Lab	01
CEU706	Foundation Engineering Lab	01	CEU727	Foundation Engineering Lab	01
CEU707	Application Software Lab	02	CEU728	Civil Engineering Software Lab	02
CEU708	Project-Phase-I	02	CEU729	Project – Phase I	02
CEU709	Industrial Visit / Training	02	CEU731	Industrial Training / Industrial Visit	01
CEU710	Industrial Lecture-II*	01	-	No equivalence	-

CEU711	Self Study-III	02	-	No equivalence	-
CEU712	Seminar	01	CEU730	Seminar	01
	No equivalence				
VIII Semester B. Tech					
CEU801	Advanced Structural Design	02	-	No equivalence	-
CEU802	Environmental Engineering	03	CEU625	Environmental Pollution and Control	03
CEU803 (A)	Elective –II (A) Structural Dynamics	03	CEU724 (A)	Elective IV (A) Structural Dynamics	03
CEU803 (B)	Elective –II (B) Earthquake Resistant Design	03	CEU823 (A)	Program Elective VI Earthquake Engineering	03
CEU803 (C)	Elective –II (C) Pavement Design & Construction	03	CEU823 (D)	Elective VI (D) Pavement Design and Construction	03
CEU803 (D)	Elective –II (D) Advanced Wastewater Treatment	03	-	No equivalence	-
CEU803 (E)	Elective –II (E) Advanced Foundation Engineering	03	CEU822 (E)	Elective V (E) Advanced Foundation Engineering	
CEU803 (F)	Elective –II (F) Advanced Construction Management	03	CEU822 (C)	Elective V (C) Construction Project Planning & System	
CEU804 (A)	Elective –III (A) Hydraulic Structures	03	CEU823 (C)	Elective VI (C) Design of Hydraulic Structures/Irrigation Engineering	
CEU804 (B)	Elective –III (B) Advanced Design of SteelStructure	03	CEU624 (A)	Program Elective II (A) Advanced Design of Steel structures	
CEU804 (C)	Elective –III (C) Finite Element Method	03	CEU822 (A)	Program Elective V (A) Finite Element Method	
CEU804 (D)	Elective –III (D) Ground Improvement Technology	03	CEU724 (D)	Program Elective IV (D) Ground Improvement Technology	
CEU804 (E)	Elective –III (E) Remote Sensing & GIS	03	CEU623 (C)	Program Elective I (C) Geographic Information Systems and Science	
CEU804(F)	Elective –III (F) Advanced Water TreatmentProcess & Technology	03	CEU624 (C)	Physico-Chemical Processes for Water Treatment	03
CEU805	Advanced Structural Design Lab	03	-	No equivalence	-
CEU806	Environmental Engineering Lab	01	-	No equivalence	-
CEU807 (A)	Elective –II Lab (A) Structural Dynamics	01	-	No equivalence	-

	Lab				
CEU807 (B)	Elective –II Lab (B) Earthquake Resistant Design Lab	01	-	No equivalence	-
CEU807 (C)	Elective –II Lab (C) Pavement Design & Construction Lab	01	-	No equivalence	-
CEU807 (D)	Elective –II Lab (D) Advanced Wastewater Treatment Lab	01	-	No equivalence	-
CEU807 (E)	Elective –II (E) Lab Advanced Foundation Engineering lab	01	-	No equivalence	-
CEU807 (F)	Elective –II (F) Lab Advanced Construction Management Lab	01	-	No equivalence	-
CEU808 (A)	Elective –III Lab(A) Hydraulic Structures Lab	01	-	No equivalence	-
CEU808 (B)	Elective –III Lab (B) Advanced Design of SteelStructure lab	01	CEU630 (A)	Advanced Design of Steel structures Lab	01
CEU808(C)	Elective –III Lab (C) Finite Element Method Lab	01	-	No equivalence	-
CEU808 (D)	Elective –III Lab (D) Ground Improvement Technology Lab	01	-	No equivalence	
CEU808 (E)	Elective –III (E) Lab Remote Sensing & GIS Lab	01	-	No equivalence	
CEU808 (F)	Elective –III (F) Lab Advanced Water TreatmentProcess &Technology Lab	01	CEU630 (C)	Physico-Chemical Processes for Water Treatment Lab	01
CEU809	Project Phase II	06	CEU824	Project – Phase II	06
CEU810	Self Study-IV	02	-	No equivalence	
CEU604	Construction Management	03	CEU821	Construction Engineering and Management	03
-	No equivalence	-	CEU723(A)	Computers Methods in Structural Analysis	03
-	No equivalence	-	CEU723(B)	Masonry Structures	03
-	No equivalence	-	CEU723(C)	Solid and Hazardous waste management	03
-	No equivalence	-	CEU723(D)	Intelligent Transportation System	03
-	No equivalence	-	CEU723(E)	Infrastructure Planning & Management	03
-	No equivalence	-	CEU724(B)	Prestressed Concrete	03
-	No equivalence	-	CEU724(B)	Prestressed Concrete	03
-	No equivalence	-	CEU724(	Port, Harbour and Bridge	03

			E)	Engineering	
-	No equivalence	-	CEU725(C)	Environmental Legislation	03
-	No equivalence	-	CEU725(D)	Disaster Management	03
-	No equivalence	-	CEU822(B)	Advanced Design of Concrete Structures	03
-	No equivalence	-	CEU822(D)	Industrial Pollution and Control	03
-	No equivalence	-	CEU823(B)	Industrial structures	03
-	No equivalence	-	CEU823(E)	Geotechnical Investigation and Construction Practices	03

CEU721 ADVANCED THEORY OF STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students familiar with the various Force and Displacement Methods of analysis of indeterminate structures;
II. To impart the students the ability to determine forces in space trusses;
III. To impart the students the knowledge of plastic analysis of structures;
IV. Tointroduce to the students the matrix methods in structural analysis;

Course Contents:

Slope Deflection Method
Degree of kinematic redundancy with axial deformation and without axial deformation for portal frames, Analysis of single bay single storey portal frames with side sway with vertical legs and inclined legs using slope deflection method (maximum unknown displacements=3)

Moment Distribution Method
Degree of static redundancy for portal frames, Analysis of single bay single storey portal frames with side sway, Analysis of symmetrical multi-bay multi storeyed frames subjected to symmetric loads only using moment distribution method.

Kani's Method
Analysis of Continuous beams and single bay single storey portal frames with and without side sway, Analysis of symmetrical multi-bay multi storeyed frames subjected to symmetric loads only

Space Trusses
Analysis of space trusses using tension coefficient method

Plastic analysis
Introduction to plastic analysis, theorems in plastic analysis, calculation of shape factor, plastic analysis of continuous beam and portal frames

Introduction to Matrix Methods
Introduction to Flexibility method and stiffness matrix method, system approach and member approach in stiffness matrix method, analysis of continuous beams and frames (maximum two degree of redundancy)

Text Books:

1. Basic Structural Analysis, Reddy C. S., Tata – McGraw Hill, New Delhi
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc

Reference Books:

1. Elementary Structural Analysis, Utku, Norris and Wilbur, McGraw Hill Inc.
2. Structural Analysis, R.C. Hibbler, Prentice Hall.
3. Theory of Structures, Stephen P. Timoshenko and D. H. Young, McGraw-Hill.
4. https://nptel.ac.in/courses/105/105/105105166/
5. https://nptel.ac.in/courses/105/105/105105180/
6. https://www.youtube.com/c/DrSuchitaHirde

Course Outcome:

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

CEU721.1: analyze indeterminate beams and portal frames using displacement methods i.e slope deflection method, moment distribution method and Kani's method;

CEU721.2: analyze space trusses and calculate forces in members using tension coefficient method;

CEU721.3: determine collapse load and plastic moment in continuous beam and portal frames;

CEU721.4:analyze beams using flexibility and stiffness matrix method.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU721.1	3	2	1	0	0	0	0	0	1	0	0	0	1	2	0
CEU721.2	3	2	1	0	0	0	0	0	1	0	0	0	1	2	0
CEU721.3	3	2	1	0	0	0	0	0	1	0	0	0	1	2	0
CEU721.4	3	2	1	0	0	0	0	0	1	0	0	0	1	2	0

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU722 FOUNDATION ENGINEERING

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students familiar with the various methods of soil exploration and their suitability;
II. To impart the students the knowledge of determination of bearing capacity and settlement of foundation from theoretical considerations and results of field tests;
III. To impart the students the knowledge of determination of pile capacity, pile group capacity and settlement by various methods and results of field tests;
IV. To impart the students the knowledge of slope stability analysis by various methods;
V. To impart the students the knowledge earth pressure analysis by various methods and determine stability of retaining structures

Course Contents:

Soil Exploration:
Objectives and methods of exploration, soil boring, boring log, hand augers, wash boring, percussion drilling, rotary drilling, Type of samples and samplers, area ratio, inside and outside clearance, Field Tests and geophysical methods, Soil investigation report, Planning of sub-surface programs, Stages in sub-surface exploration, Reconnaissance, Lateral extent and depth of exploration,

Bearing Capacity:
Bearing capacity, its type, Bearing capacity analysis by Terzaghi, types of bearing capacity failures, Effect of shape of footing, water table, eccentricity and inclination of load on bearing capacity, IS Code method, Field test -Plate load test results, SPT, SCPT, Pressuremeter test, contact pressure distribution diagram

Settlement:
Types of settlement, immediate, primary and secondary settlement, concept of differential settlement, factors and causes for differential settlement, Permissible settlements as per IS code, Proportioning of footing for uniform settlement.

Pile Foundation:
Classification of piles, Pile capacity - Static analysis, dynamic pile formula, Pile load test, Negative skin friction, Piles groups, spacing of piles in group, Pile group capacity, group efficiency, factors affecting group efficiency, settlement of pile group, Under-reamed pile

Slope Stability:
Stability analysis of infinite and finite slope of soil; Taylor's stability number, Friction circle

method, Swedish circle method

Earth Pressure:
Earth Pressure, Active, passive and earth pressure at rest, Rankin's and Coulombs theory of earth pressure, influence of surcharge, water table, wall friction, Graphical methods - Rebhann's and Culmann'smethod

Retaining Structures:
Different types of retaining structures, stability analysis of rigid walls,

Ground Improvement Techniques: Introduction

Text Books:

1. Soil Mechanics and Foundation Engineering, K. R. Arora, Standard Publishers and Distributors, New Delhi
2. Basic and Applied Soil Mechanics, Gopal Ranjan and A. V. S. Rao, New Age International Publishers
3. Geotechnical Engineering, S K Gulhati& M Datta, Tat McGraw Hill Publishing Company Ltd.

Reference Books:

1. Geotechnical Engineering, Venkatramaiah C., New Age International (P) Ltd., Publishers, New Delhi
2. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India
3. Design Aids in Soil Mechanics and Foundation Engineering, Kaniraj, R, Tata McGraw Hill, New Delhi
4. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India
5. https://nptel.ac.in/courses/105/106/105106142/
6. https://nptel.ac.in/courses/105/103/105103097/

Course Outcome:

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

CEU722.1: explain various objectives, andmethods of soil exploration and their suitability for engineering projects;

CEU722.2:determine the bearing capacity and settlement of shallow foundation for various field situations, and design the shallow foundations from the given data;

CEU722.3:determine the capacities of pile and pile groups for various field situations and design the pile foundations from the given data;

CEU722.4:determine the stability of given slope by various methods;

CEU722.5:determine the earth pressures and retaining structures for various fiels situations and determine the stability of such structures.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU722.1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	1
CEU722.2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	1
CEU722.3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	1
CEU722.4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	1
CEU722.5	3	3	1	3	1	0	0	0	0	1	0	2	3	3	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVE III

CEU723(A) COMPUTER METHODSIN STRUCTURALANALYSIS

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students the ability to analyze the skeleton structures using flexibility method;
II. To impart the students knowledge of direct stiffness method in analysis of the skeleton structures and understand its limitations;
III. To study analysis of the skeleton structures using member approach of stiffness method;
IV. To make the students aware of applications of finite difference method to beam bending problems

Course Contents:

Flexibility method
The static redundancy, flexibility coefficients, basic determinate, released structure, geometric compatibility conditions, matrix formulation, analysis of continuous beams, single bay single storey portal frames, Settlement of supports and elastic supports (Maximum three unknowns)

Stiffness Method (Structure approach)
The kinetic redundancy, degree of freedom, stiffness coefficient, joint equilibrium equations, analysis of simple problems on beam, plane rigid jointed frames without axial deformation. (Maximum three unknowns)

Stiffness Method (Member approach)
General strategy, stiffness matrix assembly process, structure stiffness matrix, hand solution of simple numerical problems on beam, plane rigid jointed frames without axial deformation . (Maximum three unknowns),Stiffness matrix of plane frame and pin jointed trusses with axial deformations (No numerical example).

Data and program organization for stiffness method
Various coding system, member-joint and joint-coordinate relations, member-displacement relation, code number approach, methods of introducing boundary conditions for restrained displacements, half band matrices

Finite Difference Method:
Application of finite difference method to beam bending problems

Text Books:

1. Matrix Methods of Structural Analysis, Dr A.S. Meghre and S. K. Deshmukh, Charotar Publishing House, Anand, India;
2. Structural Analysis, A Matrix Approach: G. S. Pandit and S. P. Gupta, Tata McGrow Hill Publishing Company Limited, New Delhi;

Reference Books:

1. Analysis of framed structures: James M. Gere and William Weaver Jr., D Van Nostrand Company Inc., Affiliated East West Press Pvt. Ltd.
2. Matrix, Finite Element, Computer and Structural Analysis: M. Mukhopadhyay, Third Edition, Oxford &IBH publishing Co. Pvt. Ltd.
3. https://nptel.ac.in/courses/105/105/105105180/

Course Outcome:

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

CEU723(A).1 analyze the skeleton structures using flexibility matrix method;

CEU723(A).2 analyze the skeleton structures using structure approach and member approach of stiffness matrix method;

CEU723(A).3 determine deflection in beams using finite difference method

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU723(A).1	3	2	1	1	0	0	0	0	0	0	0	0	1	2	0
CEU723(A).2	3	2	1	1	1	0	0	0	0	0	0	0	1	2	0
CEU723(A).3	3	2	1	1	0	0	0	0	0	0	0	0	1	2	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU723(B) MASONRY STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students familiar with the various masonry units and their material properties,
II. To impart knowledge regarding the behaviour of masonry structures under compression and lateral load,
III. To provide insight into relevant theories and principles of earthquake resistant design and introduce relevant codal provisions,
IV. To make students competent for design of masonry buildings.

Course Contents:

Material Properties of Masonry units:
History of masonry, characteristics of brick,stone,clay block,concrete block, hollow and solid units, stabilized mud block ,manufacturing process of mortar and grout, Classification and properties of mortars, selection of mortar, various test and standards Defects and Errors in masonry construction-cracks in masonry, types, reason for cracking, methods of avoiding cracks

Behaviour of Masonry under compression:
Strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, prediction of strength of masonry in Indian context, failure theories of masonry under compression, Effects of slenderness and eccentricity, effect of rate of absorption, effect of curing, effect of ageing, workmanship on compressive strength, Design of wall subjected to concentrated axial load: solid wall, cavitywall, wall with opening

Behaviour of Masonry under lateral Load:
Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength,effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures for evaluating flexural and shear strength, Design of laterally and transversally loaded walls: design criteria, design of shear wall, compound wall, masonry retaining wall

Permissible stresses:
Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses**.**

Design of load bearing masonry buildings:
Permissible compressive stress, stress reduction and shape reduction factors, increase in

permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels; Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, free standing wall; Design of load bearing masonry for buildings up to 2 storey

Earthquake resistant masonry buildings:
Behaviour of masonry during earthquakes, Analysis for earthquake forces, role of floor and roof diaphragm, concept and design of bands and bandages, splints and ties, reinforced masonry, vertical reinforcement at corner and jamb, measures in random rubble masonry, Code provisions

Text Books:

1. Building and Construction Materials, M.L.Gambhir, McGraw Hill Education Pvt.Ltd.
2. Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning Pvt.Ltd.

Reference Books:

1. Masonry structures: Behavior and Design, Drysdale, R.G.Hamid, Prentice Hall
2. Structural Masonry, Hendry A.W., Macmillan Education Ltd.
3. Brick and reinforced brick structures, Dayaratnam P., Oxford&IBH
4. IS 1905-1987 Code of practice for structural use of un reinforced masonry(3^{rd} revision) BIS, New Delhi
5. Seismic Design of reinforced concrte and Msonry Buildings, PaulayT.and Priestley, M.J.N., John-Wiley & Sons, Inc.

Course Outcome:

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

CEU723(B).1:describe the properties and uses of various masonry units, identify defects and cracks in masonry and select appropriate remedial measures;

CEU723(B).2:describe the behaviour of masonry structures under compressive and lateral loads and design different types of masonry walls for different load considerations;

CEU723(B).3:apply the methods of masonry construction and detailing practices, particularly with respect to the prescriptive seismic requirements.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU723(B).1	2	2	2	1	1	0	0	0	0	1	0	2	3	1	0
CEU723(B).2	3	3	1	2	1	0	0	0	0	1	0	3	2	1	0
CEU723(B).3	3	3	3	3	1	1	1	0	0	1	0	3	3	1	0

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU723 (C) SOLID AND HAZARDOUS WASTE MANAGEMENT

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students familiar with the principles of solid & hazardous wastemanagement.
II. To make the students familiar conversant with design & optimize techniques for solid & hazardous wastemanagement.
III. To impart students knowledge on specialized solid & hazardous wastetreatment.
IV. To make the students familiar with policies and legal implications of solid and hazardouswastes.

Course Contents:

Solid Wastes: sources, types: Municipal solid waste, Industrial solid waste, e-waste, construction and demolition waste, composition, physical, chemical, and biological properties of solidwastes

Functional Elements of Solid waste management: Generation, collection, handling, storage, processing,and transportation

DisposalofSolidwaste: Materialsseparationandprocessing,thermalconversion,biological and chemical conversion, recycling and reuse of municipal solid wastes, land filling, composting, gas generation, closure of landfills, design oflandfills

Industrialsolidwastecomposition,biodegradable,non-biodegradable,hazardous,toxicsolid wastes, methods of detoxification, disposal onland

Hazardouswastes: Origin,sourcesandtypesofhazardous,infectiousand Bio-medical wastesinmunicipal solid wastes, qualityparameters

Treatment and disposal methods of Hazardous waste: Physicochemical and biological, Stabilization and solidification, thermal methods, land disposal, siteremediation

Legal aspects of municipal and hazardous solid waste collection, conveyance, treatment and disposal

Text Books:

1 IntegratedSolidWasteManagement,G.Tchobanoglous,H.TheisenandS.A.Vigil,McGraw Hill Education (Indian Edition), (ISBN:9789339205249/9339205243)
2 HazardousWasteManagement,M.D.LaGrega,P.L.BuckinghamandJ.C.Evans,Waveland Press Inc,, (ISBN:978-1577666936/1577666933)

3 Solid waste Management in Developing Countries, A.D. Bhide and B. B. Sundaresan,National Environmental Engineering Research Institute (NEERI)Nagpur
4 Management of Municipal Solid Waste, T V Ramachandra, The Energy and Resources Institute, TERI, (ISBN:9788179931875)

Reference Books:

1 Solid Waste Management, Tchobanoglous, Theissen and Vigil,Integrated, McGraw Hill Book Co.
2 Solid wastes - Engineering Principles and ManagementIssues,G. Tchobanoglous, H. Theisen and R Eliassen, McGraw-HillBookCompany,(ISBN:9780070632356)
3 Solid Waste Management, D. J. Hagerty, J. L. Pavoni and J. E. Heer (Jr.), Van Nostrand ReinholdCo., New York, ISBN:0442230265)
4 Handbook of Solid Waste Disposal: Materials and Energy Recovery, J. L. Pavoni, Van Nostrand Reinhold environmental engineering series, Krieger Pub Co., (ISBN:978-0442230272/0442230273)
5 Infectious and Medical Waste Management, P. A. Reinhardt and J. G. Gordon, CRC Press, (ISBN:9780873711586/0873711580)

Course Outcome:

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

CEU723(C).1: develop flow-sheet based on type of solid waste management;
CEU723(C).2:evaluate quantities of waste generated;
CEU723(C).3: analyze the type of waste generated and its end use;
CEU723(C).4: describe laws related solid waste management.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU723(A).1	2	2	2	0	0	2	2	1	1	1	1	1	2	3	3
CEU723(A).2	3	1	2	0	0	1	1	0	1	0	1	1	2	2	2
CEU723(A).3	3	3	3	2	0	1	1	0	1	1	1	1	2	2	2
CEU723(A).4	0	0	0	0	0	3	3	3	0	2	0	2	1	1	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU723 (D) INTELLIGENT TRANSPORTATION SYSTEM

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To acquaint the student with the importance of ITS,
II. To impart the knowledge of using appropriate ITS data collection method,
III. To make the students competent to identify suitable telecommunication applications in traffic management,
IV. To impart the students the knowledge of different ITS functional areas,
V. To make the students competent to evaluate user needs and automation in highway systems.

Course Contents:
Introduction to Intelligent Transportation Systems(ITS):
Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS

ITS Data collection techniques:
Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection

Telecommunications in ITS: Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC)

Vehicle – Road side communication: Vehicle Positioning System; ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS)

ITS User Needs and Services: Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management

Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems

ITS Programs in the World: Overview of ITS implementations in developed countries, ITS in developing countries, case studies

Text Books:

1. Intelligent Transport Systems Pradip Kumar Sarkar, Amit Kumar Jain
2. Transport Systems: Modeling, Planning, and Evaluation by Milan Janic

Reference Books:

1. Intelligent Transportation Systems by Paolo Pagano
2. Intelligent Transport Systems: Technologies and Applications by AsierPerallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio García-Zuazola
3. Intelligent Transport Systems Standards by Bob Williams
4. The Future of Intelligent Transport Systems by George Dimitrakopoulos,Lorna Uden,IraklisVarlamis
5. **https://youtu.be/1TKhZ90lngs**
6. **https://youtu.be/0yzgMc110po**
7. **https://youtu.be/pMcOgiWlGDU**
8. **https://youtu.be/uCPlvu-bzDw**

Course Outcome:

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

CEU723(D).1 use appropriate ITS data collection method;
CEU723(D).2 select suitable telecommunication application in traffic management;
CEU723(D).3 identify different ITS functional areas;
CEU723(D).4 evaluate user needs and automation in highway systems.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU723.1	1	2	3	3	2	0	0	0	0	1	0	1	1	2	0
CEU723.2	2	1	3	2	1	0	0	0	0	1	0	2	2	3	0
CEU723.3	2	1	2	2	1	0	0	0	0	1	0	1	2	3	0
CEU723.4	3	2	3	3	2	0	0	0	0	1	0	2	1	2	0

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU723(E) INFRASTRUCTURE PLANNING & MANAGEMENT

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students the knowledge of quantifying supply & demand for infrastructure,
II. To enable students to propose and plan infrastructure,
III. To develop skills to manage integration of infrastructure,
IV. To enable students to identify trends in urban & rural infrastructure.

Course Contents:

Introduction:
Definition of basic terminologies, role of infrastructure in economic development, types of infrastructure, measurement of infrastructure capacity, bases for quantification of demand and supply of various types of infrastructure, Indian scenario in respect of adequacy and quality.

Infrastructure Planning:
Goals and objectives of infrastructure planning; Identification and quantification of the casual factors influencing the demand for infrastructure; review and application of techniques to estimate supply and demand for infrastructure; use of econometric, social and land use indicators and models to forecast the demand and level of service of infrastructure and its impact on land use; critical review of the relevant forecasting techniques; infrastructure planning to identify and prioritize preferred areas for development; Integration of strategic planning for infrastructure at urban, regional and national levels; case studies in infrastructure planning.

Infrastructure Management:
Concepts, Common aspects of urban and rural infrastructure management systems; pavement and bridge management systems, Integrated infrastructure management, Case studies

Emerging trends in infrastructure:
Overview of Public-Private Sector Participation in infrastructure projects, Understanding stakeholders' concerns, regulatory framework, risk management in infrastructure projects, public policy for infrastructure

Sectoral Overview:
Highways, railways, waterways, airports, urban and rural infrastructure: roads, housing, water supply, sanitation – case study examples.

Text Books:

1. Infrastructure Planning: James Parkin, Deepak Sharma
2. Infrastructure Planning, Engineering, and Economics Alvin S. Goodman, MakarandHastak

Reference Books:

1. Fundamentals of Infrastructure Management, Donald Coffelt, Carnegie Mellon University and Chris Hendrickson, Carnegie Mellon University
2. Infrastructure Planning Handbook: Planning, Engineering, and Economics
3. Infrastructure Engineering and Management, Ashish H. Makwana, Yogesh K. Alwani, Kunal P. Shukla, Jayeshkumar R. Pitroda
4. https://nptel.ac.in/courses/105/106/105106188/

Course Outcome:

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

CEU723(E).1: quantify supply & demand for infrastructure;

CEU723(E).2:propose and plan infrastructure;

CEU723(E).3:manage integration of infrastructure;

CEU723(E).4:identify trends in urban & rural infrastructure .

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU723(E).1	1	2	2	3	3	0	0	0	0	1	0	1	3	2	0
CEU723(E).2	2	2	3	1	2	0	0	0	0	1	0	2	2	1	0
CEU723(E).3	3	2	2	3	3	0	0	0	0	1	0	3	3	2	0
CEU723(E).4	3	3	1	2	2	0	0	0	0	1	0	2	2	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVE IV

CEU724 (A) STRUCTURAL DYNAMICS

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To introduce to the students the fundamentals of vibrations and its applications in structural engineering problems.
II. To enable thestudents to understand the responses of SDOF and MDOF systems under various dynamic loadings.
III. To impart the knowledge of dynamic analysis of continuous systems.
IV. To introduce to the students the concepts of earthquake resistant structures.

Course Contents:

Theory of Vibration:
Vibrations and the nature of time dependent phenomena, dynamic equilibrium,Energy storing and dissipation mechanism Difference between static loading and dynamic loading , Degree of freedom

Single Degree of freedom systems:
SDOF- undamped, damped free, forced (impulse, rectangular, triangular pulses and general dynamic loading) vibrations, Duhamel Integral,, Numerical scheme such as constant and linear acceleration

Multi Degree of freedom system:
Stiffness and flexibility approaches, lumped mass matrix
Equation of motion for two/three DOF systems, finding mode shapes and frequencies by solving the determinant equation and iterative techniques, orthogonality of modes

Dynamic Analysis of linear systems:MDOF system response to dynamic loading, Mode superposition method, modal matrix, Response spectrum method

Introduction to Distributed Systems:
Governing Differential Equation for beams subjected to free transverse vibrations, application to free vibration of simply supported beams

Introduction to Earthquake Engineering:
Design philosophy, concept of earthquake resistant structures, measurement of earthquake, magnitude, intensity of earthquake, earthquake resistant architectural features, Introduction to Is code provisions regarding earthquake

Text Books:

1. Structural dynamics vibrations and systems, MadhujitMukhopadhay, Ane Books India
2. Introduction to Structural Dynamics , J.M.Biggs,McGraw Hill Book Co.
3. Basics of Structural Dynamics and seismic Design, S.RDamodaraswamy and S.kavitha, PHI Learning Pvt.ltd

References Books:

1. Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (India)
2. Dynamics of Structures,R.W. Clough and J. Penzien, McGraw-Hill, New York
3. Dynamics of Structures, Patrick Paultre, John Willey & Sons
4. Structural Dynamics:Theory and Computation, Mario Paz, McGraw Hill Inc,
5. Dynamics of Structures – Theory and Applications to Earthquake Engineering, A. K. Chopra, Prentice Hall

Course Outcome:

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

CEU724(A).1: explain the dynamic equilibrium and equation of motion;
CEU724(A).2: Find out mode shape,frequenciesand amplitude of SDOF and MDOF systems;
CEU724(A).3: analyze the continuous system subjected to dynamic loading;
CEU724(A).4: describe various effects of earthquake on structures.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU724A.1	2	3	2	3	2	0	0	0	0	1	0	2	3	3	0
CEU724A.2	3	3	2	2	2	0	0	0	0	1	0	1	3	3	0
CEU724A.3	3	3	2	2	2	0	0	0	0	1	0	2	3	3	0
CEU724A.4	2	2	2	2	1	1	0	0	0	1	0	2	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU724 (B) PRESTRESSED CONCRETE

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students knowledge of basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes
II. To make the students competent to analyse prestressed concrete deck slab and beam/ girders
III. To make the students competent to design prestressed concrete deck slab and beam/ girders
IV. To make the students competent to design of end blocks for prestressed members

Course Contents:

Introduction to prestressed concrete:
Types and methods of prestressing, systems and devices, materials, losses in prestress, Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions,Transmission of prestress inpretensioned members; Anchorage zone stresses for posttensioned members

Statically determinate PSC beams:
Design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions

Statically indeterminate structures: Analysis and design - continuous beams and frames, choice of cable profile, linear transformation andconcordancy

Composite construction: Precast PSC beams and cast in-situ RC slab - Analysis and design,creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations

Analysis and design of prestressed concrete pipes, poles, and sleepers

Text Books:

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House
2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi

Reference Books:

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House
2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi
3. Limited State Design of PrestressedConcrete,GuyanY., Applied Science Publishers
4. IS: 1343- Code of Practice for Prestressed Concrete
5. IRC: 112

Course Outcome:

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

CEU 724(B).1 understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes;

CEU 724(B).2 analyseprestressed concrete deck slab and beam/ girders;

CEU 724(B).3 design prestressed concrete deck slab and beam/ girders;

CEU 724(B).4 design of end blocks for prestressed members.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU724(B).1	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU724(B).2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU724(B).3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU724(B).4	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU724 (C) AIR AND NOISE POLLUTION CONTROL

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students knowledge of various sources of air pollution,
II. To make the students aware of effects of air pollution on vegetation, materials and humans,
III. To impart the students knowledge of meteorology and air pollution monitoring,
IV. To impart the students knowledge of air pollution control,
V. To impart the students knowledge of sources and effects of noise pollution and its control.

Course Contents:

Air Pollution:
Air Environment, Air pollution, Primary and Secondary air pollutants, and sources of pollution

Particulate Matter:
Natural & manmade, viable & nonviable,Effects & removal mechanism, particle size distribution

Gaseous Pollutants: CO, CO_2, Ozone, SO_2, H_2S, Sources and effects on vegetation, materials and Humans, photo-chemical smog, secondary pollutants : NOx, Atmospheric reactions & Scavenging process

Global Atmospheric Change:
Green house gases, Regional effects of green house gases, Green house effect, Stratosphere ozone depletion, perspective on global atmospheric change

Meteorology:
Primary meteorological Parameters: wind direction and speed, Temperature, Atmospheric stability, Mixing height
Secondary meteorological Parameters: Precipitation, Humidity, Solar radiation, Visibility

Air Pollution Monitoring:
Sampling, monitoring equipment, stack monitoring quality surveillance, source monitoring, Ambient air quality, CPCB Standards

Air Pollution Control:
Various methods of control of particulate matter in industries, Gravity separator, Cyclone separator, Filters, Electrostatic precipitator, Absorption devices, Scrubbers, Combustion devices
Control of gaseous emission and process emission controls.

Noise pollution:

Nature, sources, unit of measurement, effects and control measures, CPCB recommended Noise standards

Text Books:

1. Air Pollution and Control, P. P. Mowli, N. VenkataSubbalya, DivyajyotiPrakashan, Jodhpur
2. Air Pollution, M.N.Rao & H V N Rao., Tata McGraw Hill Publishing Co. Ltd
3. Environmental Pollution Control Engineering, C. S. Rao, New age International Publishers, New Delhi

Reference Books:

1. Air Pollution, Vol. I to IV, A. C. Stern, Academic Press, New York
2. Fundamentals of Air Pollution, Stern, Wohlers, Bouble and Lower, Academic Press, New York
3. Textbook of Noise Pollution and Its Control, S. C. Bhatia, Atlantic Publishers and Distributors
4. Air Quality Monitoring- A Course Manual, NEERI

Course Outcomes:

On successful Completion of the course, students will able to:

CEU 724(C).1: identify various sources of air pollution;

CEU 724(C)2:analyse and evaluate the effects of air pollution on vegetation, materials and humans;

CEU 724(C).3: carryout air pollution monitoring;

CEU 724(C).4: design various air pollution control devices;

CEU 724(C).5: identify the sources and understand the effects of noise pollution and its control.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU724(C).1	0	0	0	0	0	0	2	1	2	0	0	2	2	1	0
CEU724(C).2	0	0	0	0	0	0	3	1	0	2	0	3	2	3	1
CEU724(C).3	0	0	0	1	0	2	2	0	0	3	0	0	3	2	3
CEU724(C).4	0	0	1	2	0	0	2	0	0	0	0	0	3	3	2
CEU724(C).5	0	0	0	0	0	0	2	1	0	2	0	2	2	2	3

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU724 (D) GROUND IMPROVEMENT TECHNOLOGY

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students familiar with the various objectives, mechanism and types of ground improvement techniques;
II. To impart the students the knowledge of various ground improvement techniques for sandy types of soils for varied applications in Civil engineering;
III. To impart the students the knowledge of various ground improvement techniques for calyey types of soils for varied applications in Civil engineering
IV. To impart the students the ability to select suitable methods of ground improvement and design the parameters related to it;

Course Contents:

Introduction:
Major soil deposits in India, Ground Improvement potential –Hazardous, poor and favourable ground conditions, Necessity of Ground Improvement, Various mechanisms of Ground Improvement, Applications, Response of Sands and Clays to externally applied Stress

Soil stabilization:
Principle, Different methods of soil stabilization
Mechanical stabilization – Principle, factors affecting, Proportioning of material, applications
Cement stabilization - Mechanism, Factors influencing, Admixtures for soil-cement, Construction of soil-cement-different methods, Applications
Lime stabilization – Principle, factors affecting, Effect on soil properties, Lime- Fly-ash stabilization, Bituminous stabilization - Mechanism, factors affecting, Construction of soil asphalt, Laboratory testing for stabilized soil, Construction methods, Field control of stabilisation, Laboratory testing, Thermal stabilization – Thermal, Heating and freezing,

In-situ densification by Vibratory compaction in sands:
Vibro-compaction-Explosion in sands, Vibratory Probes
Vibro-displacement compaction- Displacement piles, sand compaction piles (Vibro compaction piles), Vibroflotation, Impact compaction of sands
Comparison of in-situ densification methods in sands, advantages and disadvantages

Ground improvement Techniques for soft clay deposits:
Accelerated preconsolidation of soil- Principle, preloading methods, Types of drains and their installation, Design of drains, Methodology, Construction requirements, monitoring of compression, instrumentation, Applications, Consolidation by Electro-osmosis
Deep mixing Stabilization of soft soil – Lime and cement columns, Method of construction, Bearing capacity of lime columns, Bearing capacity of lime column group, Application of

lime column method
Stone column- Vibro replacement process using Vibroflot, Rammed stone column process, Bearing capacity of stone column, Design of stone columns, Applications

Grouting:
Applications, Types of grouts and their suitability, Desirable characteristics of grouts, Groutability, Grouting methods – Permeation grouting, soil facture grouting, Compaction grouting, Jet grouting, their applications, Grouting Technology- single stage grouting, Descending and Ascending stage grouting, Sleeved Pipe Grouting
Grout plant and equipment, Grouting procedure- Pre-grouting site investigation, Grout hole pattern, Grouting arrangement, Grout injection measurements and monitoring.

Reinforced Soil:
Mechanism, Types of reinforcing elements, Reinforcement-soil interaction, Reinforced soil foundation bed, failure of reinforced soil bed (BinQuet& Lee theory), Rock Reinforcement, rock anchoring

Text Books:

1. Geotechnical Engineering, S K Gulhati& M Datta, Tat McGraw Hill Publishing Company Ltd. 2005
2. Ground Improvement Techniques, P Purushothams Raj, University Science Press, 2011.
3. Foundation Engineering Handbook, HSAI – YANG FANG, CHAPMAN & HILL, New York, 1991

Reference Books:

1. Soil Mechanics and Foundation Engineering, K. R. Arora, Standard Publishers and Distributors, New Delhi
2. Basic and Applied Soil Mechanics, Gopal Ranjan and A. V. S. Rao, New Age International Publishers
3. Geotechnical Engineering, Venkatramaiah C., New Age International (P) Ltd., Publishers, New Delhi
4. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India
5. https://nptel.ac.in/courses/105/106/105106142/
6. https://nptel.ac.in/courses/105/103/105103097/

Course Outcome:

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

CEU724(D).1: explain various objectives, mechanism, types and applications of ground improvement techniques;
CEU724(D).2: explain various methods of stabilisations, their suitability for field conditions and field construction;
CEU724(D).3:explain various ground improvement methods suitable for cohesionless / sandy

soils;

CEU724(D).4: explain various ground improvement methods suitable for cohesive / clayey soils;

CEU724(D).5: design parameters related with ground improvement techniques;

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU724(D).1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU724(D).2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU724(D).3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU724(D).4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU724(D).5	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0

0-Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CEU724 (E) PORT, HARBOUR AND BRIDGE ENGINEERING

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students knowledge of planning of ports and harbours
II. To introduce to the students the basics of designs of harbours and ports,
III. To impart the students knowledge of bridge engineering regarding bridge hydrology, construction and maintenance aspects of bridges and make familiar with substructure and superstructure of bridges
IV. To make the students aware of design aspects of bridges.

Course Contents:

Docks and Harbour:

Introduction, Definition of the terms associated with docks and harbour, Requirements of harbour and port, classification of harbours with examples. Factors affecting growth of port, Major ports in India and abroad, Planning a Port, Selection of ideal location of harbour, Introduction and need of dredging

Breakwater, Jetty and Types of Docks:

Breakwater and materials of construction of breakwater, Introduction to design of breakwaters, Dock, Bulkhead and Sea Walls, Design considerations and Construction Materials, Revetments, Water front structures, Wharves, jetty, Dolphins, Different types of dock fenders, Under water construction, Uses of wet docks and Dry/Repair docks. Port facilities, Transit sheds and warehouses, Under water concreting

Bridge Engineering:

Definition of a bridge, basic components of a bridge, selection of bridge site, factors to be considered while deciding upon the type of structure for a particular bridge site, sub-surface investigation, determination of flood discharge, vertical clearance above HFL, scour depth, afflux, approach used to carry out assessment of design discharge at bridge site, economic span, abutment pier, recommended design discharge, bridge classification, parameters governing choice of superstructure, span ranges for different type of bridge superstructures usually followed in India.

Bridge Engineering: Design Aspects:

Importance of bridge economics in selection of a particular type of superstructure, characteristics and design aspects of various types of superstructures, reference codes, scopes of various bridge codes used for reference, forces to be accounted for in the analysis for the design of a bridge, IRC Class AA Loading, IRC Class B Loading, IRC Class 70R Loading, general points to be taken in to account during live load analysis for bridge design,

Bridge Substructure and Foundation:

Choice of type of foundation, general design procedure for the design of abutments, bearings for bridges, types of bearings, types of bearings recommended for various span lengths and support, expansion joints for bridge superstructures and their types.

Text Books:

1. Dock andharbour Engineering, Charotar Publishing House, Anand, OzaH.P., OzaG.H.
2. Docks,harbour and tunnels engineering, Charoter Publishing House, Anand, Srivastav R.
3. Bridge Engineering, Rangwala, Charoter Publishing House, Anand

Reference Books:

1. Principles and Practice of Bridge Engineering, Bindra S. P., , Dhanpat Rai Publications
2. Elements of Bridge Engineering,Alagia J. S., Rangwala S. C.,Charotar Publishing House, Anand
3. Elements of Bridge Engineering, Victor D. J., Oxford and IBH
4. Principles of bridge engineering, Ponnuswamy, McGraw-Hill Education (India) Pvt Limited, SBN:9780070656956, 0070656959

Course Outcomes

On successful completion of the course, students will able to:

CEU 724(E).1: explain basics of designs ofharbours and ports;

CEU 724(E).2: explain planning of ports and harbours;

CEU 724(E).3: explain basic components of bridges, their functions and designing;

CEU 724(E).4: apply design considerations of the various components of bridges .

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU724(E).1	2	0	1	0	0	0	2	1	2	0	0	2	0	1	0
CEU724(E).2	2	0	1	0	0	0	3	2	0	2	1	0	2	1	1
CEU724(E).3	2	0	1	0	0	1	2	0	3	0	0	0	2	1	0
CEU724(E).4	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

OPEN ELECTIVE II

CEU733 (A) INDUSTRIAL BUILDING PLANNING & DESIGN

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

I. To make the students aware about the various components of building, their functions, types and suitability;
II. To make the students aware about the various building services, their suitability, locations and planning;
III. To provide knowledge about general principles of planning, and building rules and bye laws
IV. To make the students conversant about the planning and design of industrial building;

Course Contents:

Location and planning of industrial areas

Selection of site for an industry; site planning of an industry in a comprehensive manner with varied considerations; study of indoor and outdoor working environment as related to industrial process of manufacture; human component as related to illumination, ventilation, noise control, etc. in working environment

Industrial spaces and structure
Review of structural systems used for industry with general idea about materials used for various components

Essential services associated with industrial planning
Planning of various services like water supply, electricity, waste generation, Reuse of effluent, effluent treatment and communications, etc

Study of various acts applicable to construction and utilization of industrial structures
Such as Factory act, pollution control act, explosives act and review of legal formalities to be completed by an architect while working on an industrial project

Considerations of the aspect of industrial safety
Related to the hazards of fire and industrial process which prove to be hazardous to persons working within the industrial structures

Industrial shade planning and aspects associated with fabrication of industrial shade
Pre-fabrication elements associated with shade fabrication, there sizes and materials used;

Insulation material to be used for achieving comfort.

Architectural design considerations

Integration of aesthetic qualities in the designing and detailing of industrial structures with meaningful choice of architectural treatments utilizing materials on the cost, ease of maintenance and upkeep

Text books:

1. Hans-Peter Wiendahl, Jürgen Reichardt, Peter Nyhuis "Handbook Factory Planning and Design"
2. Building Drawing, Shah M.G., Kale &Patki, Tata McGraw Hills Publishing Co., New Delhi

Reference books:

1. Henn, W, "Buildings for industry. Vol.1 and 2, International examples", London: Illiffe
2. "IGBC Green Factory Building Rating System"
3. "SP32 - Handbook on Functional Requirements of Industrial Buildings (Lighting And Ventilation)" Bureau of Indian Standards, New Delhi
4. IS 1893(Part 4):2005 Criteria for Earthquake Resistant Design of Structures: Part 4 Industrial Structures Including Stack Like Structures
5. IS: 962-1989, Code of practice for architectural and building drawings, BIS
6. New Delhi"Development Control Rules", MIDC,etc.
7. International Building Code (factory buildings)- International Code Council

Course Outcome:

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

CEU725(A).1: explain the site selection for an industrial area and factor related to selection of that site;

CEU725(A).2: explain the various material uses for the construction of an industrial building and the bylaw related to it.;

CEU725(A).3:explain the various services associated with industrial planning;

CEU725(A).4: explain the acts applicable to construction Such as Factory act, pollution control act, explosives act and their utilization of industrial structures;

CEU725(A).5: describe the safety required in industries related to hazards fire and any hazards processes are explained;

CEU725(A).6: describe the different aspects associated with fabrication of industrial shadeand also be able to explain Industrial shade planning and material to be used for achieving comfort; also explains the architectural considerations.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU725(A).1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU725(A).2	3	2	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU725(A).3	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU725(A).4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU725(A).5	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU725(A).6	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU733 (B) INTERIOR DESIGNINGOF BUILDINGS

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

I. To make the students aware about the various components of building, their functions, types and suitability;
II. To make the students aware about the various building services, their suitability, locations and planning;
III. To impart students knowledge about various building materials, their types, suitability and applications;
IV. To provide knowledge about elements of interior designing, principles of design and functional Planning of Interior Spaces
V. To impart students knowledge about various Interior Construction, elements &materials, their types, suitability and applications;

Course Contents:

Building Components:
Walls-Load bearing and partition, Common thickness, Door- Types of door frames, components of frame, types of shutters and their suitability, common sizes of doors, Criteria for location of doors, Windows- Types of frames, components of frame, types of shutters, types of windows, suitability, common sizes, Criteria for location of windows, Beams-Common sizes and function Columns- Common sizes and functions, Roof-Slabs, Common thickness, Staircase-Different technical terms, types, their suitability, commonly adopted dimensions, Design of staircase from given data Lintels & Arches-Types

Building Services:
Plumbing and sanitation - Layout of plumbing, symbols, Electrification & Lighting- Types of electric fitting and their suitability, Thermal & acoustic insulation- Types and their suitability

Interior Designs:
Character of good design - Values of design, Influence of environment on design in tune with community & site location, Eco friendly designing, Creative problem solving, styles & taste

Functional Planning of Interior Spaces - Planning for specific functions, Planning for coordination & circulation, Psychological space planning

Elements of Interior Design:
Form, texture, hard, medium, soft & importance of texture in design, Light- Importance of light as an art element & effect of light colour& texture, Space - Organization of space in design, Colour- Importance of colour as an art element, Colour theory- Lightness & Darkness, intensity, Brightness &, dullness warm & cool colour, paint & their properties-how to apply, textures & patterns

Principles of Interior Design:
Balance its definition, types, formal & informal balance, Harmony definition, aspect of harmony, line, shape size, texture, color, idea, Rhythm - definition, methods of obtaining rhythm repetition of shapes, progression of size, continuous line movements, Emphasis – definition, how to emphasis grouping of objects, using contrasting colour, using decoration, having sufficient plain background, using unusual lines, shapes & size

Anthropometric data:
Standard dimensions of human body in different postures, Standard dimension of furniture

Interior Materials:
Floor covering carpets, types & fixing of carpets, Finishes- Walls & Furniture finishing likes paint, wallpaper panelling & cladding, Furnishing materials - cloth, Rexene, leather, etc. curtains, Plastics - Study of types of plastics, casting, moulding process, use in interiors

Interior Elements:
Furniture - Movable furniture like chairs, tables, fixed furniture like wall units, wardrobe, kitchen platform, partitions, Upholstered furniture like sofa sets, chairs etc., Lighting, study of types of lighting, Direct & Indirect lighting, study of different wiring systems & their suitability

Interior Construction:
Partition – wooden partition, aluminium partitions, sound proofing partitions, False ceiling, different types of false ceiling systems in different materials

Text books:
1. Civil Engineering Materials, Duggal A. K., TMH Publication.
2. Building Drawing, Shah M.G., Kale &Patki, Tata McGraw Hills Publishing Co., New Delhi

Reference books:
1. Building Materials , P.C. Verghese, Prentice-Hall of India, New Delhi
2. Building Construction, Sushil Kumar, 19th edition, Standard Publishers Distributors, New Delhi
3. IS: 962-1989, Code of practice for architectural and building drawings, BIS, New Delhi
4. AutoCAD Workbook for Architects, Shannon Kyles, Wiley-Blackwell
5. Architectural Graphic Standards for Residential Construction: The Architect's and Builder's Guide to Design, Planning, and Construction Details, The American Institute of Architects, John Wiley & Sons.

Course Outcome:

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

CEU725(B).1: explain the various components of building and building services, their types, function, sizes and suitability;

CEU725(B).2:explain the various building materials, their types, function, locations and suitability

CEU725(B).3:explain elements of interior designing, principles of design and functional Planning of Interior Spaces;

CEU725(B).4:explain various Interior Construction, elements & materials, their types, suitability and applications

CEU725(B).5:carry out interior planning and designing of typical buildings from the given data;

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU725(B).1	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CEU725(B).2	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU725(B).3	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU725(B).4	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU725(B).5	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU733 (C) ENVIRONMENTAL LEGISLATION

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

I. To explain the role of law, policy and institutions in the conservation and management of natural resources as well as pollution control
II. To introduce the laws and policies both at the national and international level relating to environment
III. To equip the students with the skills needed for interpreting laws, policies and judicial decisions

Course Contents:

Basic Concepts in Environmental Law:
Introduction to the legal system; Constitution, Acts, Rules, Regulations; Indian Judiciary, judicial review, Writ petitions, Judicial activism. Introduction to environmental laws in India; Constitutional provisions; General principles in Environmental law: Precautionary principle; Polluter pays principle; Sustainable development; Public trust doctrine. Overview of legislations and basic concepts

Forest, Wildlife and Biodiversity related laws:
Evolution and Jurisprudence of Forest and Wildlife laws; Colonial Forest policies; Forest policies after independence statutory frameworks on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006

Air, Water and Marine Laws:
National Water Policy and some state policies Laws relating to prevention of pollution, access and management of water and institutional mechanism: Water Act, 1974; Water Cess Act, 1977, EPA, 1986. Pollution Control Boards Ground water and law Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act, 1981; EPA, 1986

Environment protection laws and large Projects:
Legal framework on environment protection-Environment Protection Act as the framework legislation–strength and weaknesses; EIA; National Green tribunal the courts infrastructure projects

Hazardous Substances and Activities:
Legal framework: EPA and rules made thereunder; PLI Act, 199 Principles of strict and absolute liability

International Environmental law:
Introduction to international law; sources of international law; law of treaties; signature,

ratification Evolution of international environmental law: Customary principles; Common but differentiated responsibility, Polluter pays.

TextBooks:

1. Environmental Law and Policy in India, Divan S. and Rosencranz A., 2nd ed., Oxford, New Delhi
2. Environmental Law in India, Leelakrishnan P. 3rd ed., Lexis Nexis, India

ReferenceBooks:

1. International Law and the Environment, Birnie P., Oxford
2. Environmental Jurisprudence, Desai A., Modern Law House, Allahabad
3. Ecology and Equity, Gadgil M. and Guha R., Oxford, New Delhi
4. This Fissured Land, Gadgil M. and Guha R., Oxford, New Delhi
5. Environmentalism: A Global History, Guha R., Oxford, New Delhi
6. Towards Legal Literacy: An Introduction to Law in India, Kamala S. and Singh U.K., Oxford, New Delhi

Course Outcomes:

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

CEU725(C).1: explain the basic concepts of legal system related to environmental law;

CEU725(C).2: explain the various laws related to forest, wildlife, biodiversity and air, water, and marine;

CEU725(C).3: explain different protection laws for environment and large projects;

CEU725(C).4: explains the laws established for hazardous substances and activities;

CEU725(C).5: explains the international environmental laws and how they were established.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU725(C).1	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU725(C).2	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU725(C).4	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU725(C).5	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU725(C).6	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU733 (D)DISASTER MANAGEMENT

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

I. Tounderstand different types of hazards and disaster and the challenges posed by disasters;
II. To provide broad understanding about the basic concepts of safety and Disaster Management;
III. To know the policy, planning and institutions for disaster mitigation;
IV. To impart the students the ability of understanding of the social responsibility as an engineer towards preparedness as well as mitigating the damages;

Course Contents:

Hazards and Disasters:
Definition of hazards, disasters, difference between hazard and disaster, Concept of risk and vulnerability, Risk reduction: preparedness and mitigation, Disaster management cycle, Personal and community awareness, Types of disasters, earthquake, Tsunami, Landslide, cyclone,flood,drought,forest fire, Chemical and industrial accidents

Earthquakes:
Definition and concept,intensity, Richter's scale, Element of risk, Hazard Zones in India, Typical effects, Main mitigation strategies, safe Engineering practice,Indian Standard code and enforcement Bye-Laws.

Tsunami:
Definition concept, Onset, type and cases, Warming, Elements at risk, Typical effects:Physical damage, environmental damage,casualties and Public health, Specific preparedness: Hazard mapping, early warning systems, Community preparedness, Main mitigation strategies: Site planning and land management, Engineering structures, Flood management.

Landslides:
Definition, concept, Onset time and warning, Causes, Elements at risk, Hazard zones and Indian landslides, Typical effects: Physical damage, casualties, Main mitigation strategies: Hazard mapping, Landslide practice, retaining walls, Surface drainage control works, Engineering structures, Community based mitigation.

Cyclones:

Definition, concept, Onset type, Warning, Elements at risk, Typical effects, Indian Hazard Zones, Main mitigation strategies: Hazard mapping, Land use control, Engineering Structures, Flood management, improving vegetation cover, Community based mitigation.

Floods:
Definition, concept, Onset type, Warning, Elements at risk, Hazard zones and Indian floods, Typical effects: Physical damage, Casualties and Public health, Crops and flood, Main mitigation strategies: Mapping of the flood prone areas, land use control, Flood control and management, Community based mitigation.

Droughts:
Definition, concept, Onset type and warning, Elements at risk, Typical effects, Main mitigation strategies: drought monitoring, water supply augmentation and conservation, Drought Planning.

Forest Fire:
Definition and concept, Forest fire damages in India, Operational fire management systems and organizations, Community involvement, Public policies concerning fire, the needs of fire management.

Other type of Hazards and disasters:
Chemical and Industrial disasters: brief description, effects, preparedness, Epidemic: Onset type, warning,causes and effects, risk reduction measures,
Heat waves: definition, dangers and effects, Forecasts and warning, awareness.

Policy, Planning and Institutions for disaster mitigation:
Role of policy makers in disaster risk reduction, course for specific action, Institutional arrangement in India: Central level, State Level, District and Block level, Major institutions in National and State level.

Text books:

1. Natural Hazards and Disasters, Donald and David Hyndman, Brooks /Cole Cengage Learning
2. Disaster Management: Approaches & Strategies, Tej Singh, Akansha Publishing House
3. Towards Basics of Natural Disaster, D. K. Sinha, Researchco Book Centre/Star Educational Books Distributor Pvt. Ltd,
4. Management of Natural Disasters in developing countries, H.N. Srivastava &G.D. Gupta, Daya Publishers, Delhi

Reference books:

1. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
2. Encyclopedia of disaster management, Vol I, II and IIIL Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi

3. Disaster Management Act 2005, Publisher by Govt. of India
4. Disasters in India Studies of grim reality, AnuKapur, NeetiMeeta; Deeptima; Roshani and Debanjali, Rawat Publishers, Jaipur
5. BIS Codes:- I.S 1893, I.S.4326,I.S.13920,NBC

Course Outcome:

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

CEU725(D).1: explain various categories of hazards and disasters;

CEU725(D).2: explain application of the policy, planning and institutions for disaster mitigation;

CEU725(D).3:explain management technique to make community awareness;

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU725(D).1	0	0	2	0	3	2	0	3	2	3	0	0	0	0	0
CEU725(D).2	0	0	2	0	3	2	0	3	2	3	0	0	0	0	0
CEU725(D).3	0	0	2	0	3	2	0	3	2	3	0	0	0	0	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU726 ADVANCED THEORY OF STRUCTURES LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To make the students familiar with experimental procedure to verify theorems in structural analysis;
II. To impart the students the ability to verify forces and elastic properties in structural members experimentally;
III. To make the students competent to draw influence line diagrams of various functions of indeterminate beams (propped cantilever and continuous beam);
IV. To make students familiar with analysis outputs obtained by structural engineering software and verify results manually using force and displacement methods in structural analysis.

It is a representative list of experiments/exercises. The instructor may choose experiments from the list or otherwise to fulfill the course outcomes. (**Minimumfive** experiments from Sr. no. 1 to 10 of the following list should be performed. Experiment no. 11 shall be compulsory)

Practical Work: List of experiments/exercises

1. Verification of Maxwell Reciprocal Theorem.
2. Experimental verification of Forces and displacements in truss.
3. To find horizontal reaction for two hinged arch experimentally.
4. To find elastic properties of deflected beam.
5. To measure static strains using electrical resistance linear strain gauge.
6. To draw Influence line diagram for various functions of continuous beams
7. To draw Influence line diagram for various functions of propped cantilever.
8. Experimental study of beam end rotations.
9. Experimental study of rectangular portal frame.
10. Experimental study of beam deflections under different support conditions.
11. Analysis of following structure by any structural analysis software and compare results with different analytical method
    a) SFD and BMD of Continuous beams
    b) SFD and BMD of Portal frame
    c) SFD and BMD of Multistory- Multi-bay frame

d) Analysis of Redundant truss

A Lab report for the laboratory experiments / problems should be submitted by each student.

Assessment of Lab Work:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed experiment wise using continuous assessment formats.

ESE: The End Semester Practical examination shall consist of oral examination based on Lab Work report.

Course Outcomes:

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

CEU726.1:verify theorems in structural analysis;

CEU726.2:verify forces and elastic properties in structural members experimentally;

CEU726.3: draw influence line diagrams of various functions of indeterminate beams (propped cantilever and continuous beam);

CEU726.4:interpret outputs obtained using structural engineering software and verify results manually using force and displacement methods in structural analysis.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU726.1	3	2	1	0	0	0	0	0	2	0	0	0	1	2	0
CEU726.2	3	2	1	0	0	0	0	0	2	0	0	0	1	2	0
CEU726.3	3	2	1	0	0	0	0	0	2	0	0	0	1	2	0
CEU726.4	3	2	1	0	3	0	0	0	2	0	0	0	1	2	0

1- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU727 FOUNDATION ENGINEERING LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To make students competent for collecting soil sample from the field and preparation of soil samples for various tests on soils
II. To make the students competent for conducting field tests on soil for soil exploration and prepare soil exploration report;
III. To make the students competent for conducting field tests on soil for determination of bearing capacity;
IV. To make students competent for design of shallow foundation and pile foundation analytically and using GEO5 software;
V. To make the students competent for slope stability analysis;
VI. To make the students competent for determination earth pressure and stability and retaining walls

Course Contents:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

Practical Work: List of practical

1. Subsoil strata identification by conducting soil resistivity / seismic refraction method.
2. Soil characteristic by conducting standard penetration test
3. Soil characteristic by conducting static cone penetration test.
4. Determination of safe and allowable Bearing capacity and settlement of shallow foundation from given data / results of field tests by analytical methods and using GEO5 software
5. Design of a pile group foundation from given data / results of field tests by analytical methods and using GEO5 software
6. Determination of earth pressure by analytical, graphical method and using GEO5 software
7. Slope stability analysis by graphical method and using GEO5 software
8. Stability analysis of retaining wall by analytical method and using GEO5 software

A Lab Report based on above experiments shall be submitted by each student

Assessment of Practicals:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral / practical examination based on practicals conducted.

Course Outcome:

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

CEU727.1: conduct field test for soil exploration;

CEU727.2: conduct field tests for determination of bearing capacity and settlement of shallow foundation and design the shallow foundations data analytically and by using GEO5 software;

CEU727.3:determine the capacities of pile and pile groups for various field situations and design the pile foundations from the given data analytically and by using GEO5 software;

CEU727.4: determine the stability of given slope graphically and by using GEO5 software by various methods;

CEU727.5: determine the earth pressures data analytically and by using GEO5 software and design retaining structures analytically and by using GEO5 software

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU727.1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU727.2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU727.3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU727.4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU727.5	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU728 CIVIL ENGINEERING SOFTWARE LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To make students competent for using various software for analysis and design of various structural elements,
II. To make students competent for using various software for project management,
III. To make students competent for using various software estimating and costing of civil engineering structures,
IV. To make students competent for using various software solving the problems in the field of Civil Engineering.

Course Contents:

It is representative list of practicals. The instructor may choose experiments as per requirements (so as to cover entire content of the course) from the list or otherwise.

The course focuses on the personal computer and software as ananalysis/design tool used to solve routine engineering problems. Emphasis is oncomputer-assisted solutions to practical civil and structural engineering problems.

Group A: Structural Engineering

Analysis and design of single storeyed building using any one the software listed below or any other structural engineering software:

(i) STAAD Pro
(ii) STRUDS,
(iii) SAP-2000
(iv) ETABS
(v) ANSYS

Group B:Civil Engineering

Solution of problems in **any TWO** different areas using software listed below or otherwise:

(i) **Geotechnical Engineering**: GEO5, PLAXIS 2D, OYASYS Slope - 2D slope stability analysis, OYASYS - Pdisp-3D settlements and stresses, OYASYS- Xdisp-3D Tunnel settlements and building damage assessment, MIDAS GTS
(ii) **Estimating:** QE-Pro,
(iii) **Project Management**: Microsoft Project 2010, PRIMA VERA, Contractor 6.1. PRISM, SURETRACK
(iv) **Transportation Engineering**: Road Master
(v) **Remote Sensing & GIS**: ArcGIS, GEOMATICA, ERDAS

(vi) **Environmental Engineering**: Neuro Solution

(vii) **Hydraulic Engineering**: LOOP, BRANCH, SEWER, WATER GEM, SEWER GEM & PIPE2012

A Lab Report based on above experiments shall be submitted by each student

Assessment of Practicals:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.

ESE: The End Semester Practical examination shall consist of oral examination based on Report.

Course Outcome:

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

CEU728.1:use various software for analysis and design of various structural elements,

CEU728.2:use various software for project management,

CEU728.3:use various software estimating and costing of civil engineering structures,

CEU728.4: use various software solving the problems in the field of Civil Engineering.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU728.1	3	3	3	2	3	0	0	0	0	0	0	2	3	3	0
CEU728.2	3	3	3	2	3	0	0	0	0	0	0	2	3	3	0
CEU728.3	3	3	3	2	3	0	0	0	0	0	0	2	3	3	0
CEU728.4	3	3	3	2	3	0	0	0	0	0	0	2	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU729 PROJECT PHASE I

Teaching Scheme : 04 P Total = 04 **Credits: 02**
Evaluation Scheme : ICA 100 Total Marks: 100

Course Objectives:

I. To make students competent for carrying out literature survey and a select a topic for project,
II. To make students competent for carrying out project work in the group,
III. To make students competent derive meaningful conclusions from the project work and write a project report,
IV. To make students competent to prepare a presentation and present the work.

Course Contents:

In general, a group of 3-6 students should be allowed to complete the projecton approved topic.Exhaustive survey of literature based on a clear definition of the scope andfocus of the topic should be carried out by the students.Students should finalize the topic for the project after literature survey inconsultation with the Guide.

The **Synopsis/Abstract** on the selected topic should be approved from the guide.On approval of the topic, students should initiate the topic based work. Approximately more than 30% work (of the total quantum) should becompleted by the end of VII semester.At the end of semester, each batch should submit the progress report in the approved format.

ICA: The Internal Continuous Assessment shall be based on the active participationof the students in the Project work and knowledge / skill acquired. Mid Semester Presentation shall be given by the students based on the work completed up to mid-semester. Oralexamination shall be conducted by the panel of examiners.For uniform and continuous evaluation, the Evaluation Committee comprisingof the Guide, Project Course Coordinator and Expert appointed by theProgram Head will award the marks based on the work completed by the endof semester and the presentation based on the project work.

Course Outcome:

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

CEU729.1:carry out literature survey and a select a topic for project,

CEU729.2:carrying out project work in the group,

CEU729.3:derive meaningful conclusions from the project work and write a project report,

CEU729.4:prepare a presentation and present the work,

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU729.1	3	3	3	3	5	1	1	0	3	3	1	2	3	3	3
CEU729.2	3	3	3	3	5	1	1	0	3	3	1	2	3	3	3
CEU729.3	3	3	3	3	5	1	1	0	3	3	1	2	3	3	3
CEU729.4	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU730SEMINAR

Teaching Scheme: 00 L + 00 T Total = 00 **Credits: 01**
Evaluation Scheme: ICA 50 Total Marks: 50

Course Objectives:

I. To make students competent for carrying out literature survey and a select a topic for seminar,
II. To make students competent for preparing a seminar report,
III. To make students competent to prepare a presentation for the seminar.
IV. To make students competent to present the seminar.

Course Contents:

Student shall select a topic for seminar in consultation with guide, which is **not covered in curriculum.**Students should carry out detailed literature review to collect technical details of selected topic. Student shall prepare a seminar report, its presentation and deliver a seminar.

ICA: The Internal Continuous Assessment shall be based on the work carried out by the students for Seminar Topic and the knowledge acquired. The seminarshall be assessed by the examiner panel consisting of Project Guide and Expert appointed by Program Head.

Course Outcome:

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

CEU730.1: carry out literature survey and a select a topic for seminar;

CEU730.2: prepare the seminar report

CEU730.3:prepare a presentation and present the seminar

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU730.1	3	3	2	3	1	1	1	1	1	2	2	3	3	3	1
CEU730.2	3	3	2	2	1	0	0	1	0	3	1	2	3	3	1
CEU730.3	2	2	1	2	1	0	0	0	0	3	0	2	3	3	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU731 INDUSTRIAL VISIT / TRAINING

Teaching Scheme: 00 P Total = 00 **Credits: 01**
Evaluation Scheme: ICA 25 Total Marks: 25

Course Objectives:

I. To make students competent for undergoing industrial visits / training for understanding the construction procedures at the construction sites,
II. To make students competent for preparing a report;
III. To make the students competent for making a presentation based on information collected during training / visits;
IV. To make the students competent for presenting the information collected during Industrial visit / training and knowledge acquired.

Course Contents:

A. Option 1: Industrial Training:

List of renowned industries shall be prepared by theDepartmental Coordinator of T & P Cell for the course. Two weeks trainings shall bearranged during the vacations (after the VI semester), with the consultation of Industry personnel. The students may be permittedto undergo the trainings of minimum 02 weeks as per their choices for which all the officialformalities will be completed by the students under the guidance of coursecoordinator. The students shall submit the report based on the Industrial training to the guide.

OR

B. **Option 2: Industrial Visit:**

Industry Visits to minimum three industries shall be arranged in VII semester, (forthe students unable to complete the Industrial Training during the vacation after VIsemester). The students should submit the report based on information collected during visits.

ICA: The Internal Continuous Assessment shall be based on the active participationof the students in the training/visits and knowledge / skill acquired. Thetechnical report submitted by the students shall be assessed, by the panel ofexaminers consisting of Project Guide, and expertappointed by the Program Head.

Course Outcome:

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

CEU731.1: identify sites for industrial visits / training for understanding the construction procedures at the construction sites

CEU731.2:complete industrial visits / training for understanding the construction procedures at the construction sites;

CEU731.3: prepare a report and presentation based on information collected during training /

visits

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU731.1	3	3	2	3	1	1	1	1	1	2	2	3	3	3	1
CEU731.2	3	3	2	2	1	0	0	1	0	3	1	2	3	3	1
CEU731.3	3	3	2	2	1	0	0	1	0	3	1	2	3	3	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU821 CONSTRUCTION ENGINEERING & MANAGEMENT

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To define and crystallize a construction project,

II. To apply appropriate planning techniques,

III. To allocate equipment and human resources,

IV. To choose & manage contract under different situations.

Course Contents:

Introduction:
Definition of Projects; Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data.

Techniques of planning:
Bar charts, Gantt Charts, Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

Allocation of Resources:
Materials, equipment, staff, labour and finance, resource levelling and optimal schedules, Project organisation, documentation and reporting systems. Control & monitoring; Temporary Structures in Construction; Construction Methods for various types of Structures

Construction Equipment & Automation:
Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; plastering machines; Prestressing jacks and grouting equipment; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities; Use of Drones for spread out sites; Use of robots for repetitive activities

Contract Management:
Introduction, Importance of Contracts, Overview of Contract Management, Overview of

Activities in Contract Management; Planning and People- Resource Management; Types of Contracts, Parties to a Contract; Contract Formation, Formulation of Contract, Contract Start-Up, Managing Relationships; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination, Changes & variations, Notices under contracts; Conventional and Alternative Dispute Resolution methods.

Various Acts governing Contracts:
Contract Administration and Payments- Contract Administration,Payments; Contract Management in Various Situations- Contract Management in NCB Works, Contract Management in ICB Works Contracts, Contract of Supply of Goods- Design, Supply and Installation Contracts, Contract Management in Consultancy,; Managing Risks and Change-Managing Risks, Managing Change; Contract Closure and Review-Ending a Contract, Post-Implementation Review; Legal Aspects in Contract Management-Contract Management Legal View, Dispute Resolution, Integrity in Contract Management

Text Books:

1. Construction Management: From Project Concept to Completion, Paul Netscher
2. Construction Project Management, Theory and Practices, Neeraj Kumar Jha
3. Construction Project Management, Chitkara

Reference Books:

1. Construction Project Management: A Practical Guide to Field Construction Management, S. Keoki Sears
2. Handbook of Construction Management: Scope, Schedule, and Cost Control, Abdul RazzakRumane
3. Project Planning and Control With Pert and CPM, Dr. B. C. Punmia
4. https://nptel.ac.in/courses/105/104/105104161/
5. https://nptel.ac.in/courses/105/103/105103206/

Course Outcomes:

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

CEU821.1: develop project plan and schedule;

CEU821.2: identify & allocate resources;

CEU821.3: select and utilize equipment;

CEU821.4: use contract management for project success.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU821.1	2	3	2	2	2	0	0	0	0	1	0	3	3	3	0
CEU821.2	3	2	2	3	3	0	0	0	0	1	0	2	2	1	0
CEU821.3	2	3	2	1	3	0	0	0	0	1	0	3	1	2	0
CEU821.4	3	2	3	3	2	0	0	0	0	1	0	2	2	2	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ELECTIVE V
CEU 822 (A) FINITE ELEMENT METHOD

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To introduce to the students concepts behind the formulation of Finite element method and to illustrate its applications in engineering problems,

II. To introduce to the students the various types of FEA elements and to explain their characteristics such as element stiffness matrix and load vector.

III. To illustrate the students the stress-strain, strain-displacement relations, shape functions isoparametric formulations to solve the problems,

IV. To explain the students equations in finite element methods for one dimensional, two dimensional, and three dimensional problems.

Course Contents:

Finite Element Formulation
Introduction to Approximate Methods and evolution of Finite element method, Applications, Stiffness matrix formulation, stress-strain relationship, strain displacement relationship, Equilibrium equation

Discretization and Element Characteristics
Element shapes, nodes, nodal unknowns , Coordinate systems, Principle of Discretization, Principle of minimum potential energy,Body force,traction force and point loads, stiffness matrix and load vector for an element using principle of minimum potential energy

Shape Function
Polynomial shape function, Convergence requirement of shape function,

Shape functions for one dimensional elements (bar and beam) in Cartesian and natural coordinates, shape functions for two dimensional rectangular and triangular elements

Analysis using two dimensional elements
Two dimensional problems of elasticity (Plane stress and plane strain problems), stiffness matrix and load vector for CST, LST and four noded rectangular elements, stress-strain relation and strain – displacement relation for axisymmetric problems, Elements for Axisymmetric analysis

Isoparametric Formulation and Numerical Integration
Isoparametric concept, Uniqueness of mapping, Isoparametric, superparametric and

subparametric elements , Isoparametric element (two noded bar element)for 1D analysis, stiffness matrix for isoparametric quadrilateral element, Method of Gauss Quadrature

Computer Implementation of FEM software

Structure of a FEA program, Pre and Post processor,desirable features of FEA program, Use of commercial FEA software

Text Books:

1. Concept and Application of Finite Element Analysis, M. Mukhopadhyay,Oxford and IBH Publishing Co.Pvt.Ltd.
2. Introduction to Finite Element method, P.N.Godbole,I.K.International Publishing House Pvt.Ltd.
3. Finite Element Analysis, S.S.Bhavikatti,New Age International Pvt. Ltd. Publishers
4. Finite Element Method in Structural Analysis, A.S. Meghre and Ms. K.M. Kadam, Khanna Publishers, New Delhi

Reference Books:

1. Finite Element Analysis, SeshuP., Prentice-Hall of India
2. Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York
3. Fundamentals of Finite Element Analysis, Hutton David, Mc-Graw Hill
4. Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York
5. Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier

Course Outcome:

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

CEU822(A).1: demonstrate the finite element formulation and its applications;

CEU822(A).2: identify the application of an element and derive its characteristics;

CEU822(A).3: develop element characteristic equation for 1D,2D,isoparamertic and axisymmetric elements.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU822.1	3	3	3	3	3	0	0	0	0	0	0	1	3	3	0
CEU822.2	3	3	3	3	3	0	0	0	0	0	0	1	3	3	0
CEU822.3	3	3	3	3	3	0	0	0	0	0	0	1	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU 822 (B) ADVANCED DESIGN OF CONCRETE STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students knowledge about behavior of special RC structures under various loadings,
II. To make the students competent for analysis of special RC structures,
III. To make the students competent for design of special RC structures,
IV. To make the students competent for detailing of reinforcement in special RC structures.

Course Contents:

Design of Flat Slabs:
Analysis and design of flat slab by direct design method, detailing of reinforcement as per Codal provisions

Portal Frames:
Design of portal frame with hinge base, design of portal frame with fixed base (maximum up to two storey& two bay , symmetrically loaded)

Analysis of Deep Beams:
Design of simply supported and continuous deep beam as per Codal provisions

Design of Water Tanks:

Design of rectangular and circular water tanks resting on ground and overhead, design based on relevant IS codes

Design of retaining walls:
Analysis and design of Cantilever and Counter fort retaining walls with horizontal and inclined surcharge

Text Books:

1. Reinforced Concrete Structural Elements, P Purushothaman, Mc-Grawhill publishing co.,3rdedition, 2004
2. Design and Construction of Concrete Shell Roofs, G. S. Ramaswamy, McGrawHill publication,New York, 1968
3. Reinforced Concrete: Limit State Design,A. K. Jain, Nem Chand & bros. publications, 7th edition, 2012
4. Plain and Reinforced Concrete–Vol. I & II, Jain &JaiKrishna, Nem Chand Bros. Publication,Roorkee.

Reference Books:

1. Reinforced Concrete Chimneys, Taylor C Pere, Laxmi publications, New Delhi
2. Yield Line Analysis of Slabs, Jones L L& Thomas and Hudson, Chatto&Windus Publisher, London
3. Design of deep girders, Concrete Association of India
4. Reinforced Concrete, Mallick& Gupta, Oxford &IBHpublishing co. Pvt. Ltd.
5. Code of practice IS 456-2000, Plain and reinforced concrete
6. IS 3370: code of practice concrete structures for the storage of liquids

Course Outcome:

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

CEU 822 (B).1:explain behaviour of special RC structures under various loadings;

CEU 822 (B).2:carry out analysis and design special RC structures;

CEU 822 (B).3:carry out detailing of reinforcement in special RC structures.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU822(B).1	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU822(B).2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU822(B).3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU822 (C) CONSTRUCTION PROJECT PLANNING & SYSTEM

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students competent to draw site layout,
II. Build skills to compute and procure material,
III. To impart students knowledge of monitoring, updating and controlling construction project,
IV. To make students conversant to apply modern project management tools in various situations.

Course Contents:

Planning and organizing construction site and resources:

Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation

Major Construction equipment:

Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction

Materials:

Concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and levelling

Common Good Practices in Construction:

Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings, Updating of plans: purpose, frequency and methods of updating,Common causes of time and cost overruns and corrective measures

Basics of Modern Project management systems:

Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control

Safety, Health and Environment on project sites:

Accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health

Text Books:

1. Construction Project Management, Theory and Practices, Neeraj Kumar Jha
2. Construction Project Management by Chitkara
3. Project Planning and Control With Pert and CPM, Dr.B.C.Punmia

Reference Books:

1. Construction Management: From Project Concept to Completion by Paul Netscher
2. Construction Project Management: A Practical Guide to Field Construction Management by S. Keoki Sears
3. Handbook of Construction Management: Scope, Schedule, and Cost Control by Abdul RazzakRumane
4. **https://nptel.ac.in/courses/105/102/105102206/**
5. **https://nptel.ac.in/courses/105/103/105103206/**

Course Outcome:

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

CEU822(C).1: draw site layout;
CEU822(C).2: calculate and prepare procurement plan;
CEU822(C).3: monitor,update and control construction project;
CEU822(C).4: use modern project management tools.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU822(C).1	2	3	2	2	2	0	0	0	0	1	0	3	3	3	0
CEU822(C).2	3	2	2	3	3	0	0	0	0	1	0	2	2	1	0
CEU822(C).3	2	3	2	1	3	0	0	0	0	1	0	3	1	2	0
CEU822(C).4	3	2	3	3	2	0	0	0	0	1	0	2	2	2	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU822(D) INDUSTRIAL POLLUTION AND CONTROL

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart knowledge of various industrial pollution, control measures and environmental audit,
II. To impart knowledge to students about sustainable development, water and air quality concepts and their adverse effect on air, water and land,
III. To make students competent to identify problems and suggest control measures for various industrial pollution.

Course Contents:

Industrial pollution:
Industrialization and sustainable development, Indicators of sustainability, Sustainability strategies, Barriers to sustainability, Pollution prevention and cleaner production in achieving sustainability and awareness plan, Prevention versus control of industrial pollution, Recent trends in industrial waste management, Cradle to grave concept, Life cycle analysis, Life Cycle Costing, Clean technologies, Environmental audit: Concepts, Environmental audit versus accounts audit, Compliance audit, relevant methodologies, Technical and environmental feasibility analysis

Water Pollution:
Sources of industrial water usages,Various industrial processes requiring water use and water quality, Sources of wastewater, Treatment of wastewater of various industries such as dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, and thermal power plants, Approaches to minimization of problem of industrial waste water, Equalization, Neutralization, Mixing of different effluent streams,Waste water reuse and recycling, Concept of zero discharge effluent, Pollution control measures, Process modifications in terms of raw materials or chemicalsused,General approach to planning of industrial waste water treatment and disposal, Cleaner Technologies of production for waste minimization, Effects of discharge of industrial waste water on streams and land, Controland removal of specific pollutants in industrial waste waters such as oil and grease, bio-degradable organics, chemicals such as cyanide, toxic organics, heavy metals, Stream standards and discharge standards for discharge of treated wastewater on land, andnatural water courses.

Air Pollution:
Air pollution, Sources of pollution, Effects on man, vegetation, and materials, photo-chemical smog, Various methods of control of particulate matter in industries, Control of gaseous emissions: Hood and ducts, Tall stacks, Air quality standards, Air pollution indices

Land Pollution:
Sources, Control measures, Effect ofIndustrial waste, Leachate generation and control

Noise Pollution:
Sources, Effects,Control measures, human tolerance limits

Solid Waste
Sources, Types and composition of industrial solid waste, E-waste: Sources, effects and control measures, Solid waste generation and disposal management

Hazardous wastes
Concepts, Collection, Onsite handling andprocessing, Transfer and transport, Treatment and disposal methods

Legislation
Environmental policies and regulations to encourage pollution prevention and cleaner production, Legislations for environmental pollution

Text Books:

1. Pollution Control in Process Industries, S. P. Mahajan, Tata McGraw-Hill
2. Industrial Water Pollution Control, W.W. Eckenfelder, McGraw-Hill
3. Introduction to Environmental Engineering and Science, Masters M. Gillbert, Prentice Hall of India Pvt. Ltd., New Delhi
4. Solid Waste Management in Developing Countries, Bhide A. D. and Sundaresan B. B., INSDOC, New Delhi
5. Environmental Engineering, G. N. Pande, and G. C. Carney, Tata McGraw-Hill Publishing Company Limited, New Delhi,

Reference Books:

1. Liquid Waste of Industry: Theory, Practices and Treatment, Nemcrow, Addison Wesley
2. Industrial Pollution Prevention Handbook, Freeman, H.M, McGraw Hill
3. Industrial Water Reuse and Wastewater Minimization, James G. Mann and V.A. Liu, McGraw Hill, 1999
4. Handbook of Solid Waste Management, Frank Kreith, Mc-Graw Hill Inc.
5. Management of Solid Waste in Developing Countries, Frank Flintoff, WHO Publication
6. Air Pollution, Rao, M. N., and Rao, H. V. N., Tata McGraw Hill Publishing Company Limited, New Delhi
7. Natural Systems for Waste Management and Treatment, S. C. Reed, E. J. Middlebrooks and R.W. Crites, McGraw-Hill
8. World Bank Group, "Pollution Prevention and Abatement Handbook-Towards Cleaner Production", World Bank and UNE, Washington D.C.

Course Outcome:

After completion of this course, students will be able to:

CEU822(D).1: explain and applythe concepts of industrial pollution for sustainable development of industries;

CEU822(D).2: analyze and evaluate the problems of various industrial pollutions;

CEU822(D).3: design treatment systems to mitigate various industrial pollution.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU822(D).1	2	3	1	2	1	0	1	0	1	1	0	1	3	2	1
CEU822(D).2	1	2	1	3	1	0	1	0	1	1	1	1	3	2	1
CEU822(D).3	3	1	3	1	1	1	1	1	1	1	1	1	1	3	1

0-Not correlated 1- Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU822 (E) ADVANCED FOUNDATION ENGINEERING

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students the knowledge of determination of bearing capacity and settlement of shallow foundation for different field conditions by different methods;
II. To impart the students the knowledge of determination of pile capacity, pile group capacity and settlement by various methods;
III. To impart the students the knowledge of carrying out analysis and design of well foundation;
IV. To impart the students the knowledge of carrying out analysis of anchored bulk heads

Course Contents:

Bearing Capacity Analysis:
Bearing capacity for footing on or adjacent to slopes, bearing capacity of foundation on layered soil, bearing capacity of footings subjected to eccentric loading & moments, bearing capacity of combined footing

Design of Pile Foundations:
Uplift resistance of pile, Vertical piles subjected to lateral loads, Solution with soil modulus assumed constant, short and long piles, Hansen's method, Broom's method, Use of p-y curves, Deflection of vertical piles, Batter pile groups under inclined load, Culman's method, Analytical method, Hrehnikoffi's method, Brill's approach,

Settlement Analysis:
Determination of consolidation settlement of shallow and pile foundations

Analysis and Design of Raft Foundations:
Types, Bearing capacity of rafts on sands and clay, Analysis of rigid rafts, Modulus of subgrade reaction and its determination, Effect of depth on subgrade reaction, criteria for rigid / Flexible raft, Raft analysis using modulus of subgrade reaction,

Analysis and design of Well Foundations:
Depth of well foundation, Bearing capacity of well foundation, Lateral stability of well foundation, Different methods of analysis – Terzaghi's analysis, Banergee and Gngopadhyay's method, IRC method, Design of components of well foundation

Foundations in Difficult Soils:
Expansive soils, chemically aggressive environment, soft soils, fills, collapsible soils
Anchored Bulk Heads:

Analysis of anchored bulk heads,Free earth support and fixed earth support methods, Types of anchors, Design of anchors

Text Books:

1. Soil Mechanics and Foundation Engineering, K. R. Arora, Standard Publishers and Distributors, New Delhi
2. Basic and Applied Soil Mechanics, Gopal Ranjan and A. V. S. Rao, New Age International Publishers
3. Geotechnical Engineering, S K Gulhati& M Datta, Tata McGraw Hill Publishing Company Ltd.

Reference Books:

1. Geotechnical Engineering, Venkatramaiah C., New Age International (P) Ltd., Publishers, New Delhi
2. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India
3. Geotechnical Engineering, Venkatramaiah C., New Age, International (P) Ltd., Publishers, New Delhi
4. Design Aids in Soil Mechanics and Foundation Engineering, Kaniraj, R, Tata McGraw Hill, New Delhi
5. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India
6. https://nptel.ac.in/courses/105/106/105106142/
7. https://nptel.ac.in/courses/105/103/105103097/

Course Outcome:

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

CEU822(E).1:determine bearing capacity and settlement of shallow foundation for different field conditions by different methods;

CEU822(E).2: **d**etermine pile capacity, pile group capacity and settlement;

CEU822(E).3:carry out analysis and design of well foundation;

CEU822(E).4:carry out analysis of anchored bulk heads

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU822(E).1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU822(E).2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU822(E).3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU822(E).4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVE VI

CEU 823(A) EARTHQUAKE RESISTANT STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the students the knowledge of behaviour of earth surface during earthquake and its effect on structures;
II. To make the students familiar with seismic codes of India
III. To make the students familiar with design philosophy of earthquake resistant design of various members of reinforced concrete structures.

Course Contents:

Causes of Earthquake:
The Earth and its interior, Circulations, plate tectonics, faults, seismic waves, Strong ground motions, characteristics of strong ground motions

Measurement of Earthquake:
Magnitude, Intensity, Richter scale measurement of earthquake, other modern methods of earthquake measurement

Earthquake Resistant Structures:
Concept, Seismic zones in India, Seismic design philosophy for buildings. Earthquake Resistant Planning of structures: Guidelines for achieving efficient earthquake resistant building, I.S. selection of sites, importance of architectural features in earthquake resistant building, twisting of building, geotechnical design considerations

Introduction to Indian Seismic Codes:
Introduction to IS 1893-2016, Structural response to earthquake, Seismic analysis of multistoried frames by equivalent static analysis method
Introduction to IS 13920, design strategy, strength, ductility of reinforced concrete members

Reinforced Concrete Buildings:
Seismic effects, resistance and ductile detailing in RC building elements: Beams, Columns, Beam-Column joints, footing, shear walls. (No mathematical treatment), seismic design considerations for open ground storey, short column effect. (No mathematical treatment)

Text Books:

1. Earthquake resistant Design of Structures, S. K. Duggal, Oxford University PressPublications, First edition

2. Earthquake resistant design of structures, Pankaj Agrawal and ManishShrikhande, Prentice Hall of India Pvt, Ltd. Publications

Reference Books:

1. IS 1893:2002, Criteria for Earthquake Resistant Design of Structures, Part I,Bureau of Indian Standards, New Delhi
2. IS 13920: 1993, Ductile Detailing of Reinforced Concrete Structures subjected toSeismic forces - Code of practice, Bureau of Indian Standards, New Delhi
3. Earthquake Design Practice for buildings, Davide Key, Thomas Telford Ltd.,Landon
4. Seismic Design of Reinforced Concrete and Masonry Buildings, Paulay, T.,M.J.N. Priestley, John Willey and Son's Publications
5. Handbook of seismic analysis and design of structure, FarzadNeaim
6. www.nicee.org

Course Outcome:

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

CEU823(A).1 recognize causes and effect of ground motion during earthquake on structures;

CEU823(A).2 interpret clauses of seismic code of India;

CEU823(A).3 analyse and design various members of RC structure for earthquake loading.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU823(A).1	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CEU823(A).2	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CEU823(A).3	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU823 (B) INDUSTRIAL STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students competent for designingsteel gantry girders.
II. To make the students competent for designing steel portaland gable frames.
III. To make the students competent for designing steel bunkers and silos.
IV. To make the students competent for designing steel chimneys and water tanks.

Course Contents:

Steel Gantry Girders:
Introduction, loads acting on gantry girder, permissible stress, types of gantry girders and crane rails, crane data, maximum moments and shears, construction detail, design procedure

Portal Frames:
Design of portal frame with hinge base, design of portal frame with fixed base -Gable Structures – Lightweight Structures, Cold formed steel

Steel Bunkers and Silos:
Design of square bunker – Jansen's and Airy's theories – IS Code provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams Design of cylindrical silo – Side plates – Ring girder – stiffeners

Chimneys:
Introduction, dimensions of steel stacks, chimney lining, breech openings and access ladder, loading and load combinations, design considerations, stability consideration, design of base plate, design of foundation bolts, design of foundation

Water Tanks:
Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams –Design of staging – Base plates – Foundation and anchor bolts

Design of pressed steel water tank:
Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder –Design of staging and foundation

Text Books:

1. Design of Steel Structure, Punmia B. C., Jain Ashok Kr., Jain Arun Kr., Lakshmi Publishers

Reference Books:

1. Design of Steel Structures, Ram Chandra, Standard Publishers
2. Design of Steel Structures, Subramaniyam

Course Outcome:

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

CEU823 (B).1:design Steel Gantry Girders.
CEU823 (B).2: design Steel Portal, Gable Frames.
CEU823 (B).3: design Steel Bunkers and Silos.
CEU823 (B).4: design steel Chimneys and Water Tanks.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU823(B).1	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU823(B).2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU823(B).3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU823(B).4	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU823 (C) DESIGN OF HYDRAULIC STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To make the students familiar with the various types of hydraulic structures, their components, functions and suitability for various field conditions;

II. To impart the students the knowledge of principles and methods of design of hydraulic structures;

III. To impart the students the knowledge of design of hydraulic structures;

Course Contents:

Gravity Dams: Design, Analysis by various methods, Foundation treatment

Buttress Dams: Types, Economic spacing of buttresses, Design considerations

Arch Dams: Types, Methods of design, Thickness of arch and central angle by thincylinder theory

Spillways: Flood routing through spillways, Design of ogee spillway and chute spillway

Recent Spillway: Stepped spillway: advantages, design procedure, air entrainment, Labyrinth spillway: working, advantages, design

Energy Dissipaters: Types, Components, Influence of tail water rating curve onchoice of energy Dissipater, Design of hydraulic jump type Basins

Canal Head Regulator: Design of canal head regulator

Canal Structures: Types of hydraulic structures and their suitability**,** Hydraulic design of aqueduct, siphon aqueduct, super passage andother canal structures

Principal Components of Hydropower Station: Intakes and Trash racks, Waterconductor system, Tunnels, Surge tanks, Penstocks

Text Books:

1. Earth and Rockfill Dam, J. L. Sherard, John Wiley, New York
2. Concrete Dam,R.S. Varshney, Oxford IBH

Reference Books:

1. Engineering for Dams Volume I,II and III, W. P. Creager and Justin J. D., John Wiley and Sons
2. Design of Small Dams, USBR, Oxford IBH
3. Design of Large Dams, USBR, Oxford IBH

4. Design of Gravity Dams, USBR, Oxford IBH
5. Concrete Dams, H.D. Sharma., Metropolitan Book Co, New Delhi
6. The Hydraulics of stepped chutes and spillways, Hubert Chanson, A.A. Balkema Publisher, Tokyo

Course Outcome:

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

CEU823(C).1: explain various types of hydraulic structures, their components and functions and suitability for various field conditions;

CEU823(C).2:explain the design procedure for various types of hydraulic structures;

CEU823(C).3:carry out the design of various types of hydraulic structures;

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU823(C).1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU823(C).2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU823(C).3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU823(D) PAVEMENT DESIGN AND CONSTRUCTION

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. To impart the knowledge about various material characteristics for pavement,
II. To make the students aware about various design parameters required for analysis and design of pavements
III. To make students competent for analysis and design of flexible pavements by various methods,
IV. To make students competent for analysis and design of Rigid pavements by various methods.

Course Contents:

General:
Pavement components and their functions,Structural action of flexible and rigid pavements, Characteristics of highway and airfield pavements,

Design Parameters:
Factors affecting design and performance of pavements, Design parameters, Standard Axle load and wheel assemblies for road vehicles, Tire and contact pressure, contact area imprints, Computations of ESWL for flexible and rigid pavements, ;ESWL of multiple wheels, Repeated loads and EWL factors, Load repetitions and distributions of traffic for highwayand airfield pavement, wheel load stresses, Pavement behaviour under transient traffic loads

Material Characteristics:
AASHO sub grade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for “K”, Marshal’s method of Bituminous mix design. Modulus of rupture and elasticity, poison’s ratio and coefficient of thermal expansion of concrete, Layer equivalency concepts, MORTH specifications for pavement material

Analysis of Flexible and Rigid Pavements:
Stress, Strain deformation analysis forsingle, two three and multilayered flexible pavement systems, Stress and deflectionsfor rigid pavements due to load and temperature, influence Charts, ultimate loadanalysis, joints in C.C. pavements

Design of Flexible Pavement:
Flexible Pavement Design Methods For Highways and Airports: Empirical, Semi-empirical and theoretical approaches, North Dakota Cone, Group index, CBR, IRC-37, Brumister, Triaxial (Kansas), AASHO method of design, bituminous mix design methods and specifications, Numerical problems on mix design

Design of Rigid Pavement:

IRC-58, PA. C.A., AASHO method of design, Design of joints and reinforcement, Design of continuously reinforced concrete pavements, design of mix for CC pavement

Pavement Construction:

Principles of gradation/proportioning of soil-aggregate mixes and compaction;, construction and quality control checks for mechanical, soil-cement, soil-bitumen and soil-lime stabilization methods, methods ofcement concrete pavement construction with construction of joints and quality controltest, Use of additives, Repairs, Maintenance and rehabilitation of pavements

Text Books:

1. Principles and Practice of Highway Engg., Sharma and Sharma, Asia Publishing House
2. Highway Engineering; K. Khanna, and Justo, C.E.G., Khanna Publication

Reference Books:

1. Principles of Pavement Design, Yoder &Witzace, Prentice Hall
2. Pavement Analysis and Design, H. H. Yang, Pearson Prentice Hall
3. Design and Performance of Road Pavements, Croney&Croney, McGraw Hill
4. Pavement Analysis and Design, Yang and H. Huang, Pearson Prentice Hall
5. Pavement Design, Yoder and Witzech, McGraw-Hill
6. Functional Designing of Pavements, Teng, McGraw- Hill

Course Outcomes:

After Completion of course students will able to:

CEP823(D).1; describe various design parameters required for analysis and design of pavements;

CEP823(D).1; describe various material characteristics required for analysis and design of pavements;

CEP823(D).2 apply design parameters and material characteristics for analysis and design of flexible pavements;

CEP823(D).4 apply design parameters and material characteristics for analysis and design of rigid pavements.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU823(D).1	3	3	3	3	1	0	0	0	0	1	0	2	3	3	0
CEU823(D).2	3	2	3	2	1	0	0	0	0	1	0	1	2	2	0
CEU823(D).3	3	3	3	3	1	0	0	0	0	1	0	2	3	3	0
CEU823(D).4	3	3	3	3	1	0	0	0	0	1	0	2	3	3	0

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU823 (E) GEOTECHNICAL INVESTIGATION AND CONSTRUCTION PRACTICES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs 30 min

Course Objectives:

I. Provide knowledge of various methods of subsurface investigation and their suitability and preparation of reports
II. Make students familiar with IS code provisions for subsurface investigations for civil engineering project.
III. Impart knowledge of construction methods, procedures and practices for various civil engineering structures

Course Contents:

GEOTECHNICAL INVESTIGATIONS
Introduction
Planning of sub-surface programs, Stages in sub-surface exploration, Reconnaissance, Lateral extent and depth of exploration, Methods of exploration – trial pits, open excavation, boring etc.

Types of boring and drilling
Auger, wash, rotary, percussion, core etc., Methods for stabilization of borehole, Types of soil samples, Sample disturbance, storage, labelling and transportation of samples

Types of soil samplers
Split spoon sampler, Scraper bucket sampler, Shelby tube and thin wall samplers, piston sampler, Denison sampler, hand carved samples etc.

Field Tests
Standard Penetration Test, Cone Penetration Test, Vane Shear Test, Plate Load Test, Pressure Meter Test, Geophysical methods, Seismic methods, Electrical resistivity methods. Determination of ground water table

Soil investigation report
Bore log, soil profile and contents of report, Field records Site investigation in the view of ground improvement

GEOTECHNICAL CONSTRUCTION

Embankment construction:

Earth moving equipment, Compaction equipment, types of rollers and their suitability, Methods of quality control, Compaction specifications,

Deep Foundation Construction:

Piling- Pile driving methods, Pile driving equipment, Construction of Driven Precast concrete piles, Driven cast in situ concrete piles, Bored cast-in- situ concrete piles, under reamed piles, micro piles, Patented methods of pile construction

Excavation, Underground construction:

Excavate-support Sequence, Temporary & permanent Soil Support, Spoil removal, Methods of Dewatering systems-open sumps and ditches, Well point systems, Deep-well drainage, Horizontal wells, Vacuum dewatering Systems, Dewatering by Electro-osmosis

Cofferdams:

Types of cofferdams and their construction

Caissons & Wells:

Construction of open caisson, Pneumatic Caisson, Construction of well foundation-Components and their functions, Different shapes, Sinking of Wells, Measures for rectification of tilt and shift

Construction of stabilised Roads:

Construction of cement stabilised roads- different methods, Construction of Lime stabilised roads and bituminous stabilised roads, Field control of stabilization

Tunnel:

Cut and Cover tunnels, Bored tunnels: Shield Tunnels, Types of Shield tunnel machines, Tunnel Boring machines (TBM) – Types of TBMs, Components of full face TBM, Choice between Full face and Partial face machines,

Text Books:

1. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor
2. Basic and Applied soil mechanics: Gopal Ranjan& A.S. Rao, New Edge Int. ltd.

Reference Books:

1. Soil Mechanics in Theory and Practice: Alam Singh, Asia Publisher and Distributor,
2. Advanced Foundation Engineering: Murthy VNS, CBS publishing,
3. Geotechnical Engineering: S. K. Gulhati& M. Datta, Tata McGraw-Hill, New Delhi

Course Outcome:

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

CEU823(E).1: Discuss various methods of subsurface investigation and their suitability;

CEU823(E).2: **S**uggest and plan suitable methods of soil exploration based on the requirement of civil engineering project and site condition and prepare soil exploration report;

CEU823(E).3:Describe construction methods, procedures and practices for foundations, stabilised rods, embankments, and underground structures;

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU823(E).1	3	2	2	1	3	2	1	3	2	3	1	1	1	3	3
CEU823(E).2	3	2	2	1	3	2	1	3	2	3	1	1	1	3	3
CEU823(E).3	3	2	2	1	3	2	1	3	2	3	1	1	1	3	3

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU823(F) WATER DISTRIBUTION SYSTEMS

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

I. To understand water supply, distribution and transmission networks

II. To impart knowledge to students about types and methods for analysis of water distribution and transmission networks

III. To study various methods for design of water distribution and transmission networks

Course Contents:

Hydraulics

Water supply systems, Principles, Head loss formulae: Darcy-Weisbach formula, Hazen-Williams formula, Modified Hazen-Williams formula, Series and parallel connection of pipes, Equivalent pipes,

Analysis of networks

Analysis of branched water distribution networks, Formulation of equations for looped water distribution networks, Analysis of flow in looped networks using Hardy Cross, Newton-Raphson and linear theory methods, Introduction of gradient method of analysis, Reservoirs, Pumps and valves in water distribution systems, Flow dependent analysis of multi-reservoir systems, Introduction to head-dependent analysis, Node flow analysis of water distribution networks, Node head-flow relationships, direct and indirect methods

Design of networks

Optimal diameter of pumping main, Design of pumping main, Water hammer, Design of water distribution networks using critical path method, Flow path algorithm, Formulation of optimization model, Application of cost-head loss ratio method and linear programming technique to optimal design of branched networks, Determining number of branching configuration for a looped network, Use of path concept and minimum spanning tree concept, Application of critical path method for design of looped networks

Text Books:

1. Bhave, P. R. and Gupta R., Analysis of water distribution Networks, Nawas Publishing Co, New Delhi.
2. Walksi T. M., Analysis of water distribution System, Van NostandReinheld G, New York, USA, 1984.

Reference Books:

1. CPHEEO, Manual on Water Supply and Treatment, Ministry of Urban Development Government of India, New Delhi.

2. Bhave P. R., Optimal Design of Water Distribution Networks, Nawas Publishing Co, New Delhi
3. Jeppson R. W., Analysis of flow in pipe networks, Ann Arbon Science AunArbox Michigan, USA

Course Outcome:

After completion of this course, students will be able to:

CEU822(G).1 understand and identify various problems of water supply, water distribution and transmission networks,

CEU822(G).2 analyze of water distribution and transmission networks,

CEU822(G).3 design water distribution and transmission networks.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU822(G).1	3	2	1	2	1	1	1	1	2	1	0	1	2	2	2
CEU822(G).2	1	3	3	2	1	1	1	1	2	1	1	2	2	2	1
CEU822(G).3	1	1	3	2	1	1	1	2	2	2	2	2	2	3	1

1- Not correlated 1- Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU824 PROJECT PHASE II

Teaching Scheme : 10 P Total = 10 **Credits: 06**
Evaluation Scheme : ICA 100 + ESE 100 Total Marks: 200

Course Objectives:

I. To make students competent for carrying out literature survey and a select a topic for project,
II. To make students competent for carrying out project work in the group,
III. To make students competent derive meaningful conclusions from the project work and write a project report,
IV. To make students competent to prepare a presentation and present the work.

Course Contents:

Project work decided in VII semester (either option A or option B) shall be continued.Students should complete implementation of ideas given in synopsis; so as to complete the project work in consultation with the guide and the Industry personnel in case of option B. Students shall submit the final project report in the approved format and as per guidelines.

ICA: The Internal Continuous Assessment shall be based on the active participationof the students in the Project work and knowledge / skill acquired. Internal examination of project shall include demonstration, presentation ofcomplete work and oral examination based on the project work, conducted by the panel ofexaminers consisting of Project Guide, and Expertappointed by Program Head.

ESE: The End Semester Examination for Project shall consist of Demonstration ifany, presentation and oral examinations based on the project report.

Option A. Project Phase II

The Project work started in VII semester shall be continued in semester VIII.At the end of semester, each batch should submit the project report in the approved format.

Option B. Industry Internship Project

The students may be permittedto undergo the Industry Internship Project for which all the officialformalities to be completed by the students under the guidance of guide allotted in VII semester. The students opting for Industrial Internship Project shall have to complete Phase II by taking the related trainings and performing tasks assigned to them in the Industry, under the guidance of Industry personnel as well as guide. The students shall submit the report based on the IndustryInternship Project along with the Completion Certificate given by Industry.

ICA: For Option A: The Internal Continuous Assessment shall be based on the active participationof the students in the Project work and knowledge / skill acquired. Mid Semester Presentation shall be given by the students based on the work completed up to mid-semester.Oralexamination shall be conducted by the panel of examiners.For uniform and continuous evaluation, the Evaluation Committee comprisingof the Guide, and Expert appointed by theProgram Head will award the marks based on the work completed by the endof semester and the presentation based on the project work.

For Option B: The Internal Continuous Assessment shall be carried out by guide on the basis of monthly progress reports received from industry personnel. Oralexamination shall be conducted by the panel of examiners.For uniform and continuous evaluation, the Evaluation Committee comprisingof the Guide, and Expert appointed by theProgram Head will award the marks based on the work completed by the endof semester and the presentation based on the project work

Course Outcome:

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

CEU824.1:complete the project work in the group (if option A is selected) OR project work through Industry Internship (if option B is selected),

CEU824.2:derive meaningful conclusions from the project work and write a project report,

CEU824.3:prepare a presentation and present the work,

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU824.1	3	3	3	3	5	1	1	0	3	3	1	2	3	3	3
CEU824.2	3	3	3	3	5	1	1	0	3	3	1	2	3	3	3
CEU824.3	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

GOVT. COLLEGE OF ENGINEERING, AMRAVATI

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM
of
THIRD YEAR
B. TECH. (Civil Engineering)

2021- 22

Program Outcomes:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

PSO1. Identify Civil Engineering related real life issues/ problems in industries, society and provide feasible solution

PSO2. Apply the knowledge of the basic streams of Civil Engineering viz. Building Construction, Transportation Engineering, Environmental Engineering and Irrigation Engineering (Water Resources Engineering) to design Civil Engineering Structures

PSO3. Plan and implement the activities in the Civil Engineering Project as a part of team or as an individual

B. Tech. (Civil Engineering)

SEM -III														
Category			**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory			**Practical**		**Total**		
	Course Code	**Name of the Course**	**Theory Hrs /week**	**Tutorial Hrs/week**	**Practical Hrs/week**	**Total**	**MSE**	**TA**	**ESE**	**ICA**	**ESE**			
Basic Science Course	SHU321A SHU 322A	Differential Equations and Probability *Integral Calculus and Probability	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU321	Fluid Mechanics	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU322	Building Materials and Construction	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU323	Solid Mechanics	3	-	-	3	30	10	60	-	-	100		3
Mandatory courses (noncredit)	SHU323	Introduction to Constitution of India	1	-	-	-	-	20	30	-	-	50		0
Professional Core courses	CEU324	Engineering Geology	3	-	-	3	30	10	60	-	-	100		3
Professional Core courses	CEU325	Building Materials and Construction Lab	-	-	2	2	-	-	-	25	25	50		1
Professional Core courses	CEU326	Engineering Geology Lab	-	-	2	2	-	-	-	25	25	50		1
Professional Core courses	CEU327	Solid Mechanics Lab	-	-	2	2	-	-	-	25	25	50		1
		Total	**16**	**00**	**06**	**21**	**150**	**70**	**330**	**75**	**75**	**700**		**18**

For Direct Second Year Admitted Students

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM -IV

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core courses	CEU421	Hydraulic Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU422	Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU423	Transportation Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU424	Concrete Technology	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU425	Hydrology & Water Resources Engineering	3	-	-	3	30	10	60	-	-	100	3
Basic Science	SHU422	Environmental Study	1	-	-	-	-	20	30	-	-	50	0
Professional Core courses	CEU426	Hydraulic Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU427	Surveying Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU428	Transportation Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU429	Materials, Testing & Evaluation Lab	-	-	2	2	-	-	-	25	25	50	1
Basic Science	SHU425	Human Values and Ethics	1	-	-	1	-	20	30	-	-	50	0
	Total		**17**	**00**	**08**	**24**	**150**	**90**	**360**	**100**	**100**	**800**	**19**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM- V														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU521	Theory of Structures	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU522	Geotechnical Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU523	Water Supply Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU524	Design of Steel Structures	3	-	-	3	30	10	60	-	-	100	3
Professional Core Course	CEU525	Advanced Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU526	Building Planning & Drawing	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU527	Geotechnical Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU528	Design of Steel Structures Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU529	Building Planning & Drawing Lab	-	-	4	4	-	-	-	25	25	50	2
Professional Core Courses	CEU530	Advanced Surveying Lab	-	-	2	2	-	-	-	25	25	50	1
	Total		**16**	**2**	**10**	**28**	**180**	**60**	**360**	**100**	**100**	**800**	**23**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs **except for CEU524, and CEU526 for which duration shall be 3.00 hours**

B. Tech. (Civil Engineering)

SEM - VI

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU621	Design of Reinforced Concrete Structures	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU622	Estimation & Costing	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU623	Program Elective – I	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU624	Program Elective – II	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU625	Environmental Pollution and Control	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU626*	Open Elective I	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU627	Design of Reinforced Concrete Structures Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU628	Estimation & Costing Lab	-	-	4	4	-	-	-	50	25	75	2
Professional Core Courses	CEU629	Environmental pollution and Control Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU630	Program Elective – II Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU631	Minor Project	-	-	2	2	-	-	-	25	-	25	1
	Total		**17**	**01**	**12**	**30**	**150**	**50**	**360**	**150**	**100**	**810**	**24**

*** to be offered for other Departments**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs **except for CEU621 AND CEU622 for which duration shall be 3.00 hours**

B. Tech. (Civil Engineering)

SEM - VII														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU721	Advanced Theory of Structures	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU722	Foundation Engineering	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU723	Program Elective – III	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU724	Program Elective IV	3	-	-	03	30	10	60	-	-	100	3
Open subjects	CEU725*	Open Elective II	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU726	Advanced Theory of Structures Lab	-	-	02	02	-	-	-	25	25	50	1
Professional Core Courses	CEU727	Foundation Engineering Lab	-	-	02	02	-	-	-	25	25	50	1
Professional Core Courses	CEU728	Civil Engineering Software Lab	-	-	04	04	-	-	-	50	-	50	2
Professional Core Courses	CEU729	Project – Phase I	-	-	04	04	-	-	-	100	-	100	2
Professional Core Courses	CEU730	Seminar	-	-	02	02	-	-	-	50	-	50	1
Professional Core Courses	CEU731	Industrial Training / Industrial Visit	-	-	-	-	-	-	-	25	-	25	1
		Total	**15**	**00**	**14**	**29**	**120**	**40**	**300**	**275**	**50**	**785**	**23**

*** to be offered to other Departments**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM - VIII														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU821	Construction Engineering & Management	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU822	Program Elective V	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU823	Program Elective VI	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU824	*Project – Phase II	-	-	10	10	-	-	-	100	100	200	6
	Total		**09**	**00**	**10**	**19**	**90**	**30**	**180**	**100**	**100**	**500**	**15**

*A) Project Work in the Institute **OR** B) Industry Internship

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE I CEU623	**PROGRAM ELECTIVE II** CEU624	**PROGRAM ELECTIVE III** CEU723	**PROGRAM ELECTIVE IV** CEU724	**PROGRAM ELECTIVE V** CEU822	**PROGRAM ELECTIVE VI** CEU823
A. Structural Mechanics B. Reliability Analysis of Structures C. Geographic Information Systems and Science D. Railway, Tunnel & Airport Engineering E. Hydraulic Modelling	A. Advanced Design of Steel structures B. Advanced Concrete Technology C. Physico-Chemical Processes for Water Treatment D. Open Channel Flow E. Repairs, Rehabilitation & Retrofitting of structures	A. Computer Methods in Structural Analysis B. Masonry Structures C. Solid and Hazardous waste management D. Intelligent Transportation System E. Infrastructure Planning & Management	A. Structural Dynamics B. Prestressed Concrete C. Air and Noise pollution control D. Ground Improvement Technology E. Port, Harbour and Bridge Engineering	A. Finite Element Method B. Advanced Design of Concrete Structures C. Construction Project Planning & System D. Industrial Pollution and Control E. Advanced Foundation Engineering	A. Earthquake Engineering B. Industrial structures C. Design of Hydraulic Structures/Irrigation Engineering D. Pavement Material, Design and Construction E. Geotechnical Investigation and Construction Practices

LIST OF OPEN ELECTIVES

OPEN ELECTIVE I CEU626	**OPEN ELECTIVE II** CEU725
A. Introduction to Civil Engineering B. Project Management C. Construction Techniques	A. Industrial Building Planning & Design B. Interior Designs and Drawing C. Environmental Legislation D. Disaster Management

Equivalence of Third Yr. B. Tech Courses

As per Previous (old) structure			**Equivalence As per Revised Structure w.e.f 2021-22**		
Course Codes	**Name of Course**	**Credits**	**Course Codes**	**Name of Course**	**Credits**
		V Semester B. Tech			
CEU501	Theory of Structures	04	CEU521	Theory of Structures	03
CEU502	Design of Steel Structures	04	CEU524	Design of Steel Structures	03
CEU503	Building Design and Drawing	02	CEU526	Building Planning and Drawing	03
CEU504	Advanced Surveying	03	CEU525	Advanced Surveying	03
CEU505	Water Treatment Processes and Technology	03	CEU523	Water Supply Engineering	03
CEU506	Design of Steel Structures Lab	01	CEU528	Design of Steel Structures lab	01
CEU507	Building Design and Drawing Lab	02	CEU529	Building Planning and Drawing Lab	02
CEU508	Advanced Surveying Lab	01	CEU530	Advanced Surveying Lab	01
CEU509	Water Treatment Processes and Technology Lab	01	CEU629	Environmental pollution and Control Lab	01
CEU510	Self Study - I	02	-	No equivalence	
		VI Semester B. Tech			
CEU601	Design of Reinforced Concrete Structures	03	CEU621	Design of Reinforced Concrete Structures	03
CEU602	Geotechnical Engineering	03	CEU522	Geotechnical Engineering	03
CEU603	Water Resources Engineering	03	CEU425	Hydrology and Water Resources Engineering	03
CEU604	Construction Management	03	CEU821	Construction Engineering and Management	03
CEU605	Estimating and Costing	03	CEU622	Estimating and Costing	03
CEU606	Design of Reinforced Concrete Structures Lab	01	CEU627	Design of Reinforced Concrete Structures Lab	01
CEU607	Geotechnical Engineering Lab	01	CEU527	Geotechnical Engineering Lab	01
CEU608	Water Resources Engineering Lab	01	-	No equivalence	-
CEU609	Estimating and Costing Lab	01	CEU628	Estimating and Costing Lab	02

CEU610	Minor project	02	CEU631	Minor project	01
CEU611	Self Study II	02	-	No equivalence	-
CEU612	Industrial Lecture - I	-	-	No equivalence	-
CEU603 (A)	Advanced Structural Analysis	03	CEU623 (A)	Structural Mechanics	03
-	No equivalence	-	CEU623 (B)	Reliability Analysis of Structures	03
-	No equivalence	-	CEU623 (C)	Geographic Information Systems and Science	03
CEU703 (E)	Railway, Tunnel & Airport Engineering	03	CEU623 (D)	Railway, Tunnel & Airport Engineering	03
-	No equivalence	-	CEU623 (E)	Hydraulic Modelling	03
CEU804 (B)	Advanced Design of Steel Structure	03	CEU624 (A)	Advanced Design of Steel structures	03
-	No equivalence	-	CEU624 (B)	Advanced Concrete Technology	03
CEU804 (F)	Advanced Water Treatment Process & Technology		CEU624 (C)	Physico-Chemical Processes for Water Treatment	03
-	No equivalence	-	CEU624 (D)	Open Channel Flow	03
-	No equivalence	-	CEU624 (E)	Repairs, Rehabilitation & Retrofitting of structures	03
CEU802	Environmental Engineering		CEU625	Environmental Pollution and Control	03
-	No equivalence	-	CEU626 (A)	Introduction to Civil Engineering	03
CEU704 (D)	Project Management	03	CEU626 (B)	Project Management	03
-	No equivalence	-	CEU626 (C)	Construction Techniques	03
CEU808 (B)	Advanced Design of Steel Structure Lab		CEU630 (A)	Advanced Design of Steel structures Lab	01
-	No equivalence	-	CEU630 (B)	Advanced Concrete Technology lab	01
CEU808 (F)	Advanced Water Treatment Process & Technology lab		CEU630 (C)	Physico-Chemical Processes for Water Treatment Lab	01
-	No equivalence	-	CEU630 (D)	Open Channel Flow lab	01
-	No equivalence	-	CEU630 (E)	Repairs, Rehabilitation & Retrofitting of structures Lab	01

CEU521 THEORY OF STRUCTURES

Teaching Scheme: 02 L + 01 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs. 30 min

Course Objectives:

I. Student should identify type of structures
II. Student should analyze determinate beams and frames and indeterminate beams
III. Student should apply Energy theorems for Beams and Trusses
IV. Student should draw Influence line diagrams for determinate beams and trusses and select the maxima for the function
V. Student should analyze three hinged arches

Course Contents:

Introduction: Classification of Structures, concept of indeterminacy, Introduction to methods of analysis, force and displacement methods

Indeterminate Beams: Analysis of fixed beam and propped cantilever, rotation and sinking of support, introduction to method of consistent deformation

Energy methods: Castigliano's theorem for slope and deflection, Unit load method, slope and deflection in determinate beams and portals, Deflection in determinate trusses.

Influence line diagrams: Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, absolute maximum shear force and bending moment, Influence line diagrams for reactions, bending moment and shear force for determinate beams, Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.

Three hinged arches: Three hinged arches subjected to static loads, bending moment, radial shear and axial thrust.

Slope deflection method: Analysis of continuous beams with and without sinking of support. Analysis of portal frames without side sway.

Moment Distribution method: Analysis of continuous beams with and without sinking of support

Text Books:

1. Basic Structural Analysis, Reddy C. S, 3rd edition, Tata McGraw Hill, New Delhi, 2004.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc, 1983

Reference Books:

1. Elementary Structural Analysis, Utku, Norris and Wilbur, 4th Edition, McGraw Hill Inc,

1991
2. Structural Analysis, R.C. Hibbler, 4th Edition, Prentice Hall, 1999
3. https://nptel.ac.in/courses/105/105/105105109/

Course Outcomes:

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

CEU521.1 identify types of structures and suitable method of analysis;

CEU521.2 analyze determinate beams and frames and indeterminate beams;

CEU521.3 apply energy theorems to analysis of determinate beams and trusses;

CEU521.4 draw Influence line diagrams for determinate beams and trusses and select the maxima for the function;

CEU521.5 analyze three hinged arches.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU521.1	3	2	1	0	0	0	0	0	1	0	0	0	0	1	0
CEU521.2	3	2	1	0	0	0	0	0	1	0	0	0	0	1	0
CEU521.3	3	2	1	0	0	0	0	0	1	0	0	0	0	1	0
CEU521.4	3	2	1	0	0	0	0	0	1	0	0	0	0	1	0
CEU521.5	3	2	1	0	0	0	0	0	1	0	0	0	0	1	0

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CEU522 GEOTECHNICAL ENGINEERING

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs. 30 min.

Course Objectives:

I. To make the students familiar with the various physical and index properties of soil, their relationship, determination and classification of soils for engineering purposes;
II. To introduce to the students the permeability and compaction properties of soil and their applications for field problems;
III. To impart the students the knowledge of shear strength of soil and its determination for varied applications in Civil engineering.
IV. To impart the students the ability to determine stress distribution in soil due to various loading condition;
V. To introduce the concept of consolidation and its theory for determination of settlements

Course Contents:

Introduction and Physical properties of soil
Introduction to Geotechnical Engineering, soil formation and their types, Regional soil deposits in India and their characteristics, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering, Scope of soil engineering, Soil as three-phase system Basic Definitions of physical properties and Relationships, Laboratory determination of physical properties

Index properties and classification of Soil
Plasticity of soil, consistency limits and consistency indices, activity and sensitivity, Determination of consistency limits, significance of consistency limits, Particle size analysis, Classification of Soils, particle size classification, Indian standard soil classification system, Field identification of soils, general characteristics of soil in different groups.

Permeability of Soil and Seepage analysis
Darcy's law, validity of Darcy's law, factors affecting permeability of soil, Range of coefficient of permeability of common soils, Determination of coefficient of permeability: Laboratory method and field methods, Permeability of stratified soils, Seepage Analysis-stream and potential functions, Flow net, its characteristics, graphical method to plot flow nets, determination of seepage, Quick condition

Compaction of Soil
Definition, Importance of compaction, factors affecting compaction, laboratory determination of optimum moisture content and maximum dry density, Standard and modified compaction

test, influence of compaction on soil properties, Compaction in field, compaction specifications and field control

Stresses in soils

Soil as a semi-infinite mass, State of stress at a point in soil mass, Stresses due to point load - Boussinesq theory, assumptions, Influence factors, Variation of stresses along horizontal and vertical planes, Isobars and pressure bulbs, Stresses due to uniformly loaded circular area, rectangular loaded area, , Newmark's Influence Chart, Contact pressures, computation of displacements from elastic theory

Shear Strength

Mohr circle of stress and its characteristics, principal planes, relation between major and minor principal stresses, sources of shear strength, Concept of failure, Mohr-Coulomb theory of failure, Determination of shear strength parameters by lab tests, types of shear tests: unconfined compression test, vane shear test, direct shear test, triaxial compression tests, UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength Parameters

Consolidation of Soil

Definition, Spring analogy, comparison between compaction and consolidation, laboratory consolidation test, interpretation of consolidation test results, Terzaghi's theory of consolidation, computation of consolidation settlement, Over-consolidated, normally consolidated and under-consolidated soils

Text Books:

1. Soil Mechanics and Foundation Engineering, K. R. Arora, 7th edition, Standard Publishers and Distributors, New Delhi, 2018
2. Basic and Applied Soil Mechanics, Gopal Ranjan and A. V. S. Rao, New Age International Publishers, 2nd edition, 2005
3. Geotechnical Engineering, Venkatramaiah C.; 3rd Edition, New Age International (P) Ltd., Publishers, New Delhi, 2006

Reference Books:

1. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India, 2008
2. Geotechnical Engineering, Gulhati S. K. and Datta M., 1st Edition, Tata McGraw Hill Publishing Company, New Delhi, 2005.
3. SP: 36 (Part 1), Compendium of Indian Standards on Soil Engineering, Part 1, BIS New Delhi, 2001.
4. Geotechnical Engineering: A Practical Problem Solving Approach, Nagaratnam Sivakugan and Braja M. Das, , J. Ross Publishing, 2010
5. https://nptel.ac.in/courses/105/106/105106142/
6. https://nptel.ac.in/courses/105/103/105103097/

Course Outcome:

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

CEU522.1: explain various physical and index properties of soil, their lab determination and classify soils based on index properties of soils and as per IS codal provisions;

CEU522.2: determine permeability of soil, and graphically plot the flow net and determine the seepage quantities;

CEU522.3: determine compaction properties of soil and select suitable field method of compaction based on the type of soil;

CEU522.4: Compute the vertical stress in a semi-infinite soil mass due to various loading conditions and plot various stress distribution diagrams in a soil mass;

CEU522.5: select suitable test and determine shear strength parameters of different types of soils for various geotechnical analyses;

CEU522.6: explain the basic mechanism of consolidation of soil and evaluate consolidation settlements against time.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU522.2	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU522.3	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU522.4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU522.5	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU522.6	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0

0- Not correlated   1 - Weakly Correlated   2- Moderately Correlated   3- Strongly Correlated

CEU523 WATER SUPPLY ENGINEERING

Teaching Scheme: 03L + 00T Total: 03 Credits: 03
Evaluation Scheme: 30 MSE +10 TA+60 ESE Total Marks: 100
Duration of ESE: 2 hrs. 30 min.

Course Objectives:

I. To impart knowledge to students about the various aspects of water supply scheme in general and recent developments in particular.
II. To make students familiar with water quality concepts and on water treatment process
III. To design the various units of water treatment plant

Course Contents:

Sources of water:
Surface water, Ground water, Infiltration galleries, relative suitability; Intake works, functions, types

Water quality:
Impurities in water: Turbidity, pH, Chlorides, Hardness, Residual Chlorine, Fluoride, MPN, Significance, water quality standards

Demand of water:
Water demand for domestic purposes, Fire demand, Per capita demand, Factors affecting consumption, Fluctuation in demand: Design period for water supply components, Population forecast: Arithmetical increase, Incremental increase, Geometrical increase, and Logistic curve methods

Water Treatment:
Flow diagram of conventional WTP; Aeration: Principle, Purpose, Design of cascade aerator; Flash mixer, function, design, power requirement; Flocculation: Coagulants, quantity of coagulants, Design of mechanical flocculator; Sedimentation: General equation for settling of discrete particles, Plain settling tank, Tube settler, Design of settling tank, Surface over flow rate, Detention period; flow through velocity, weir loading, design of Clariflocculator
Filtration: Objective, Filter Media, Rapid and slow sand filters: Number of filter units, Rate of filtration, Under drainage system, Backwashing, Negative head, Operation and cleaning, Design of slow and rapid sand filters, Design of under drainage system, Pressure filter
Disinfection: Objectives, Methods of disinfection, Chlorination: Free and combined chlorine, Residual chlorine, Effect of pH, Bleaching powder, Types of chlorination, Pre-chlorination, Post-chlorination, Break point chlorination, Super chlorination

Advanced Treatments:

Softening: Lime soda, Quantity of lime and soda, Ion exchange; Effect of fluoride, Fluoridation and De-fluoridation. Water softeners and purifiers for individual houses and apartments

Distribution system:

Types of distribution system: Continuous and intermittent supply systems, Gravity, Pumping and combined systems; Layout of distribution system: Dead end, Grid iron, Circular, and Radial systems; Major Losses & Minor Losses, Analysis of distribution system: Hardy Cross method, Service Reservoirs: Elevated service reservoir, Balancing reservoir, Necessity, Location, Capacity calculation by Mass curve method

Text Books:

1. Water supply and Sanitary Engineering, S. K. Hussain, 3rd edition, CBS Publishers, New Delhi, 2017
2. Water Supply & Sanitary Engineering, G. S. Birdie, , Dhanpat Rai & Sons, New Delhi, 2010
3. Water and Waste water Technology, Hammer M.J., Prentice-Hall of India Pvt Ltd, seventh edition, 2012

Reference Books:

1. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Government of India Publication, New Delhi, 1993
2. Water Treatment Processes, S. Vigneswaran and C. Visvanathan, CRC Press, Boca Raton, Florida, USA, 1995.
3. Environmental Engineering, A. P. Sincer and G. A. Sincere, Prentice-Hall of India Private Limited, New Delhi, 2004.
4. Water Supply and Waste Water Disposal, Fair G. M. and Geyer J. C., John Wiley and Sons, Inc., New York, 1968.
5. https://nptel.ac.in/courses/105/104/105104102/

Course Outcomes:

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

CEU523.1: plan water supply scheme and identify current water supply engineering problems;

CEU523.2: analyse the data required for design of water supply scheme;

CEU523.3: design various units of conventional water treatment plant.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU523.1	1	2	2	1	1	2	2	1	3	2	1	1	2	1	2
CEU523.2	2	3	1	2	2	2	2	1	2	3	2	2	2	1	2
CEU523.3	3	2	3	2	2	2	2	2	3	3	2	2	2	1	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU524 DESIGN OF STEEL STRUCTURES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 3hrs.

Course Objectives:

I. To inculcate in the students, the understanding of structural steel and general structural behaviour of steel structural elements , design philosophies

II. To make the students familiar with relevant BIS codes, design aids for their effective use in the steel structure design;

III. To impart the students, the ability to analyse, design and detail of different structural steel elements & connections according to relevant BIS codes & design aids

Course Contents:

Materials, structures and specifications:
Structural steel, types, properties of structural steel, advantages & limitations of steel as a structural material, Forms of structural steel- Hot formed steel, Cold formed steel (light gauged
Basis of structural design-design consideration, codes, specifications & design aids, Failure criteria for steel

Design Approach:
Concept of elastic analysis, plastic analysis as applicable to steel structures, Classification of steel structures on the basis of moment resistance behaviour, Basic concept of working stress method, Limit state design philosophy (LSM) in detail as applicable to steel structures

Loading and load combination
Loads-dead loads, imposed loads, temperature effect, earthquakes, determination of wind loads as per IS 875(part 3), load combinations

Designs using Limit State Method:

Connections:
Riveted connections - Introduction
Welded connections: Advantages of welding, types and properties of weld, types of joint, weld symbols, analysis & design of welded connections, simple joints, moment resistant connections
Bolted connections: Bolt types, behaviour of bolted connections, design strength of ordinary bearing black bolt, simple connection, and moment resistant connection

Design of tension members:
Types of tension member, factors affecting strength of tension member, design of tension member

Design of compression members:

Possible failure modes, classification of cross section, section used for compression members, effective length, single angle strut, built up compression members, lacing & battening, column splicing for axial loads only.

Design of simple beams:

Behaviour of beams in bending, designs strength of laterally supported beams in bending, design strength of laterally unsupported beams in bending, maximum deflection, web buckling and crippling,

Design of column bases:

Types of bases, design of solid slab base & gusseted base for axial & eccentric loading

Introduction to earthquake resistant design of steel structures:

Design philosophy & methodology, seismic analysis methods, seismic behaviour of steel structures (Numerical examples are not expected)

Text books:

1. Design of Steel Structures: Limit State, N. Subramanian, Oxford University Press, India, 2018
2. Limit State Design of Steel Structures, Duggal S.K, McGraw Hill Education India. 2019
3. Design of Steel Structures (By Limit State Method as Per IS: 800—2007), S.S. Bhavikatti, I. K. International Pvt. Ltd.

Reference books:

1. BIS: 800, "Code of practice for General Construction in steel", BIS New Delhi
2. BIS: 875 (Part I to V), "Code of Practice for Design Loads (other than earthquake) for Buildings and Structures", BIS, New Delhi
3. SP 6 (Part I to Part 6), "Handbook for structural engineers - Structural steel sections"
4. IS Handbook No 1 BIS New Delhi
5. Structural Steel Design, Jack C Mccormac and Stephen F Csernak, 5th Edition, Pearson India
6. Limit State Design of Steel Structures as per IS:800/2007, S. Kanthimathinathan, I K International Publishing House Pvt. Ltd., 2014
7. Limit State Design in Structural Steel, Shiyekar M. R, PHI learning 3rd edition
8. Comprehensive Design of Steel Structures", B C Punamia, Laxmi Publications 2015
9. Design of Steel Structures Vol. I & II, Ramchandra, Std Book house 2015
10. https://nptel.ac.in/courses/105/106/105106112/

Course Outcomes:

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

CEU524.1: assimilate about the structural steel as a material, structural behaviour of steel structural elements & design philosophies for design of steel structures;

CEU524.2: analyze and design welded/ bolted connections with detailing as per relevant IS codes;

CEU524.3: analyze and design tension members, compression members, column splicing with detailing as per relevant IS codes;

CEU524.4: analyze and design simple beams laterally restrained & laterally unrestrained with detailing as per relevant IS codes;

CEU524.5: analyze and design slab bases & gusted bases with detailing as per relevant IS codes;

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU524.1	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CEU524.2	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU524.3	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU524.4	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU524.5	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU525 ADVANCED SURVEYING

Teaching Scheme: 03 L + 00 T Total: 03 Credits: 03
Evaluation Scheme: 30 MSE + 60 ESE + 10 TA Total Marks: 100
Duration of ESE: 2 hrs. 30 min.

Course Objectives:

I. To impart the knowledge to students for carrying out Levelling and Surveying using advanced surveying equipment's such as digital level, Digital Theodolite and Total Station
II. To acquaint students with the knowledge for carrying out special surveys
III. To acquaint students with the knowledge for carrying out computations for setting different types of curves for highways

Course Contents:

Use of Advance Surveying and levelling equipment:

Digital Level: Study and use of Digital level, transferring and storing levelling data in computers, preparing levelling pages through software, Profile levelling using digital level

Digital Theodolite: Study and use of Digital Theodolite, Measuring distances, elevation, horizontal and vertical angles of an object and. between points, Traversing and entering the field data, Plotting the traverse and checking the error of closure

Total Station: Parts of a Total Station, Accessories, Advantages and Applications, Setup, Selecting a job, scale factor setting, azimuth angle setting, entering instrument station data, Prisms and their types, Measurements with total stations, Recording angle and distance observations in the field, Calculating rectangular coordinate information from the field observation, Data retrieval, Data processing, Data plotting, Construction layout using Total station , Checking for sources of errors with Total Station, Maintenance, Traversing

Drones: Land mapping drones and their benefits, drone surveying applications, benefits of drone surveying, land surveying by drones, processing drone data, processing drone survey data, aerial surveying and mapping with drone images, drone softwares, drone regulations

Route Surveying:

Simple circular curves -its elements, Designation & Degree of curve, Chord & Arc definition, Fundamental Geometry, Methods of setting out simple circular curves- chain & tape method, Rankin method, Two Theodolite method, obstacles in setting out curves, Transition curves: Purpose, length of transition curve, Ideal transition curve, characteristics of transition curve, computation of combined curve, procedure of setting out combined curve, Compound curve, theory and methods of setting out compound curves Vertical curves: Requirement, Types, properties, Length, location of highest or lowest point

Special Surveys:

City Surveying: Control, equipment, topographic map, underground map, city property survey, location of details

Underground Surveying: Surface alignment, correlation of surface and underground surveys, transferring levels underground, underground bench marks, setting out of pipelines and sewers

Construction and Boundary Surveys: Setting out pipe line, setting out buildings and structures, setting out a highway

Hydrographic Surveying: Necessity, control, shore line survey, river survey, gauges, sounding equipment and procedure of taking sounding, methods of locating sounding, three point problem- mechanical & graphical solutions

Text books:

1. Surveying part-I & II, T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi Griha Prakashan, Pune
2. Surveying Vol. I and Vol .II, B. C. Punmia, Laxmi Publication (P) New Delhi
3. Surveying, Vol-I, II and III, Arora, K.R, Standard Book House, New Delhi

Reference books:

1. Surveying and Levelling, Vol. I and II, Bhavikatti, S.S., I.K. International Publishing House Pvt. Ltd Surveying Vol. I, S.K. Duggal, Tata McGraw Hill Publishing Company Ltd., New Delhi
2. Surveying Vol. I, Santosh kumar Garg, Khanna Publishers, New Delhi
3. Higher Surveying, Chandra, A.M, New Age International (P) Ltd.
4. https://nptel.ac.in/courses/105/104/105104100/

Course Outcomes:

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

CEU525.1 apply the knowledge, techniques, skills for using advanced surveying equipment for engineering and surveying activities;

CEU525.2 carry out computations for setting different types of curves for highways;

CEU525.3 apply knowledge for land and property surveying for preparation of maps.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU525.1	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3
CEU525.2	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3
CEU525.3	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU526 BUILDING PLANNING AND DRAWING

Teaching Scheme: 02 L + 01 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hrs.

Course Objectives:

I. To impart knowledge to the students about fundamentals of building planning, drawing, IS codal provisions, principals of planning and building rules and byelaws ,

II. To make students competent to plan residential buildings and public buildings following principles of planning and building rules and byelaws,

III. To develop students to prepare working and submission drawings of buildings

Introduction
Importance of building drawing in construction & estimation, Selection of scales, dimensioning in architectural drawing, Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS:962, optima Layout of sheet for Civil Engineering drawing and selection of scales for drawing, dimensioning standards, Free hand sketching of building components

Building Drawing:
Concept of line plan & working drawings of the building, Combined first angle & third angle method of projection, Developing working drawings of the building from the given line plan – floor plans, elevation, sections, Foundation plan, Details to be incorporated in the working drawings, Necessity and use of working drawing, Site plan, Block plan, Layout plan, Layout plans for load bearing and framed structures, Use of Notes to improve clarity, Principles of isometrics and perspective drawing, Perspective view of building, Fundamentals of Building Information Modelling (BIM), Building Plan Management System (BPMS)

Planning of Residential Buildings:
Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement, Climate and design consideration, Orientation of buildings, requirement of the owner, Provision of mezzanine floor, balconies and porches in the building, design of stair cases suitable for residential and public buildings, Common sizes of doors, windows and other components, Common utilities such as parking, security, water supply, sanitation, etc. for apartments

Building Rules and Bye-Laws:
Building rules and bye-laws for residential buildings, layout for a housing project, alternatives of building types viz. individual bungalows, semi-detached houses, row houses, apartments, Rules governing Plot area, Built-up area, Floor space Index, Building line, Set back, side margins, height of building, Provisions as per NCB, Requirements of drawing as

per plan sanctioning authorities, Conversion of agriculture land to non-agriculture land. Planning of layout, Rules to be adopted while developing any layout

Planning of Public Buildings:

Types of public building and their requirements, planning of public buildings such as School Buildings, College Buildings, Hospitals, Primary Health Center, Multiplex, Shopping Complex

Text Books:

1. Building Drawing, Shah M.G., Kale & Patki, Tata McGraw Hills Publishing Co., New Delhi
2. Civil Engineering Drawing, Subhash C Sharma & Gurucharan Singh, Standard Publishers
3. Building Drawing and Detailing, Balagopal and Prabhu, Spades publishing KDR building, Calicut, (1987)

Reference Books:

1. IS: 962, "Code of practice for architectural and building drawings", BIS, New Delhi
2. Architectural Graphic Standards for Residential Construction: The Architect's and Builder's Guide to Design, Planning, and Construction Details, The American Institute of Architects, John Wiley & Sons
3. Architectural Working Drawings: Residential and Commercial Buildings, Spence William P., 1993
4. Malik R. S. and Meo, G. S., "Civil Engineering Drawing", Computech Publication Ltd., New Asian
5. Sikka, V. B., A Course in Civil Engineering Drawing, S.K. Kataria & Sons

Course Outcomes:

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

CEU526.1: develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs;

CEU526.2: develop working and submission drawings of the building along using principles of planning and building rules and bye-laws;

CEU526.3: use fundamentals of Building Information Modelling (BIM), Building Plan Management System (BPMS) for building planning and design;

CEU526.4: examine a design critically and with understanding of CAD to interpret drawings, and to produce designs using a combination of 2D and 3D software;

CEU526.5: develop drawings for conventional structures using practical norms.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU526.1	0	1	0	0	0	1	0	2	3	0	0	3	3	3	3
CEU526.2	0	0	0	1	0	2	0	2	3	3	0	3	3	3	2
CEU526.3	0	0	0	1	3	2	0	0	3	3	0	3	2	3	2
CEU526.4	0	0	0	0	3	0	0	0	2	1	0	2	2	3	2
CEU526.5	0	0	0	0	0	0	0	0	3	0	2	3	3	3	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU527 GEOTECHNICAL ENGINEERING LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To make students familiar with collecting soil sample from the field and preparation of soil samples for various tests on soils.

II. To make students competent to determine the physical and index properties of soil as per IS code procedure

III. To inculcate in the students skill of conducting permeability and compaction properties of soil;

IV. To make students familiar with conducting the shear strength tests on different types of soil and determine shear strength parameters

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

Practical Work: List of practicals

1. Determination of moisture content using Oven Drying method and Torsion balance moisture meter
2. Determination of Specific gravity of Soils
3. Determination of Field Density using Core Cutter method
4. Determination of Field Density using Sand replacement method
5. Grain size distribution by Sieve Analysis and classification as per IS
6. Determination of Consistency limits - Liquid limit, Plastic limit, Shrinkage limit
7. Determination of Permeability of soil test by Constant-head test method / Falling-head method
8. Determination of Compaction properties of soil: Standard Proctor test / Modified Proctor test
9. Determination of Relative density
10. Vane shear test
11. Direct Shear Test
12. Unconfined Compression Strength Test.
13. C. B. R. Test
14. Triaxial Test (UU / Quick test)

Assessment of Practicals:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral / practical examination based on practicals conducted.

Course Outcomes:

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

CEU527.1: perform various laboratory experiments to determine physical and index properties of soil and classify soil as per IS codal provisions;

CEU527.2: determine the permeability of soils by various laboratory tests;

CEU527.3: perform laboratory test to determine the maximum dry density and optimum moisture content of the soil;

CEU527.4:perform various shear strength tests and determine shear strength parameters suitable to the different field conditions.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU527.1	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU527.2	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU527.3	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU527.4	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU528 DESIGN OF STEEL STRUCTURES LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To inculcate in the students, the understanding of the structural planning & general behaviour of steel structure

II. To make the students familiar with relevant IS codes related to steel structure design;

III. To impart the students, the ability to analyse, design and draw structural drawing of simple industrial structure with steel roof truss & various steel structural elements according to relevant IS codes;

Practical Work:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

PART I:

Analysis and Design of different steel structural elements of a simple industrial structure:

1. Analysis of roof truss
2. Design of members of roof truss
3. Design of purlin
4. Design of beam (Laterally supported and laterally unsupported)
5. Design of connections (bolted or welded)
6. Design of Column (simple or compound)
7. Design of column base (Slab base or Gusseted base).

A lab report consisting of manual/software designs of a simple industrial structure & related structural drawings using AutoCAD shall be submitted by each student

PART II: Field Visits:

Field visits to any steel structure / Industrial building / Railway station / Bridges / Plate girders , Transmission towers and submission of the report on site visits including copy of structural drawings collected from site.(if feasible).

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on design problems and site visit report.

Course Outcomes:

After completion of this course, students will be able to :

CEU528.1: evaluate the loads, analyze the structure and determine the design actions in various structural elements of simple industrial structure;

CEU528.2: design structural' elements using relevant IS codes along with connections & carry out detailing (manually/using software);

CEU528.3: write a technical report based on information collected during site visits.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU528.1	3	3	3	2	2	1	0	0	1	3	0	1	3	3	1
CEU528.2	3	3	3	2	2	1	0	0	1	3	0	1	3	3	1
CEU528.3	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU529 BUILDING PLANNING AND DRAWING LAB

Teaching Scheme: 04 P **Credits: 02**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To inculcate in the students skills of planning of residential buildings and public buildings as per principles of planning and building rules and byelaws

II. To develop students for creating working drawings of buildings using conventional drawing instruments

III. To develop students for creating working drawings and 3D drawings of buildings using a combination of 2D and 3D software;

Practical Work

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

PART 1 – MANUAL DRAWING

List of Drawings:

1. Developing working drawing of single storied residential building from the given line plan on full size imperial sheet using conventional drawing instruments.
2. Planning of a two storeyed framed structure type residential building from the given data and preparing its line plan on the graph paper (Separate data may be given to different groups of students)
3. Developing working drawings of the planned building (in sr. no. 2) from the given line plan on full size imperial sheet using conventional drawing instruments
4. Developing line plans of any two public building from the given data on A2 size graph paper.
5. Sketch book containing at least 10 free hand sketches of building components and elevation features such as balconies, sun shades and sun breakers, grills, compound walls, compound gates, grill doors, door panel designs, window frame design, Furniture placement in rooms, kitchen layout, plumbing layout, etc

PART II – CAD DRAWING

A. **Commands in CAD software**: Introduction to computer aided drawing, coordinate systems, reference planes, Setting Commands: Initial settings, Drawing basic entities, Modify commands- selecting objects, various methods of selection, Erase, Move, Copy, Break, Mirror, Rotate, Scale, Trim, Extend, Offset, Formatting commands- point style, line weight, line types, colour, text style, dimension style, table style, units, Layers, Text and Dimensioning- Linear, aligned, continue dimensioning, Viewing - Zooming and Panning, Blocks- making and inserting blocks, Saving and printing drawing, selection of scale

B. **Development of Building drawings in CAD**

i) Developing working drawings of the planned building (in sr. no. 2 in manual drawing) using CAD software [AutoCAD / Revit] and taking printouts to suitable scale

ii) Developing Perspective view of planned building (in sr. no. 2 in manual drawing) using CAD software [AutoCAD / Revit] and taking printouts

Practical Assessment:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral / practical examination based on practicals conducted.

Course Outcome:

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

CEU529.1: carryout planning of residential buildings and public building using principle of planning and building rules and byelaws;

CEU529.2: produce working drawings buildings using conventional drawing instruments;

CEU529.3: produce working drawings designs of buildings and 3D drawings of building using a combination of 2D and 3D CAD software.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU529.1	1	1	1	0	**0**	1	**0**	2	3	2	1	3	3	3	3
CEU529.2	1	0	1	0	1	1	**0**	2	3	3	**0**	3	3	3	2
CEU529.3	2	2	1	1	3	**0**	**0**	**0**	3	3	**0**	3	2	3	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU530 ADVANCED SURVEYING LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To impart student the skill of setting out curves by various methods
II. To impart the students skills of using various advanced surveying equipments for profile levelling and contouring;
III. To impart students knowledge of Preparation of layouts and plans for property and land surveying;
IV. To impart the students skills of setting out alignments for roads, railways, dams etc

Practical Work:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

A. Setting Out Curves:

1. Setting out a simple circular curve by offsets from long chord
2. Setting out a simple circular curve by Rankine's method of tangent angle (Deflection angles)

B. Digital Level:

1. Conduct profile levelling along the given alignment for a road using digital level and Plotting the profile of the alignment surveyed
2. Transferring levelling data to computers and developing and printing levelling pages using software.

C. Digital Theodolite:

1. Traversing and plotting : Setting out a closed traverse with minimum 6 sides and entering the field data using Digital Theodolite, Plotting the traverse and checking the error of closure
2. Setting out an open traverse with minimum 5 sides using total station and entering the field data and Plotting the traverse

D. Total Station:

1. Measuring horizontal and vertical angles, Prolonging a given straight line, Determination of magnetic bearing of given straight lines

2. Traversing and plotting : Setting out a closed traverse with minimum 6 sides and entering the field data, Transferring the data to computers using software, Plotting the traverse using software

E. Use of Mobile Apps:

1. Use of mobiles apps for various surveying applications

Assessment of Practicals:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral / practical examination based on practicals conducted.

Course Outcomes:

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

CEU530.1 acquire the skill of using advanced surveying equipments such as digital level, digital theodolite and total station for surveying and levelling;

CEU530.2 set out simple, combined, compound and reverse curves;

CEU530.3 carry out surveying operations for city and property surveying.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU530.1	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3
CEU530.2	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3
CEU530.3	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU621 DESIGN OF REINFORCED CONCRETE STRUCTURES

Teaching Scheme: 03 L+ 00 T **Total: 03** **Credits: 03**
Evaluation Scheme: 30 MSE +10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hrs.

Course Objectives:

I. To inculcate in the students, the understanding of reinforced concrete and general structural behaviour of RCC structural elements

II. To make the students familiar with relevant IS codes related to reinforced concrete design;

III. To impart the students, the ability to analyse, design and detailing of various reinforced concrete structural members of framed structure according to relevant IS codes.

Course Contents:

Concept of reinforced concrete:

History of RCC, objectives of analysis & design, properties of concrete and steel, different philosophies of design, working stress method: concept, rectangular beams under flexure

Limit state method:

Introduction, Limit state of collapse, limit state of serviceability, Limit state of flexure (theories and examples), computation of parameters of governing equations, singly reinforced rectangular beams, doubly reinforced rectangular beams – theory & numerical problems.

Design of Slabs:

Concept of one-way and two way slabs, design of one way slab: simply supported slab, cantilever slab, continuous slab, Design of two-way slabs: simply supported and with different boundary conditions, Detailing of reinforcement.

Design of Beams:

Design of Rectangular & flanged beams – theory and numerical problems, design for shear, bond, and development length with detailing of reinforcement

Design of Columns:

Limit state of collapse: Compression, design of short columns subjected to axial load, axial load with uniaxial bending & axial load with biaxial bending, slender columns.

Design of Footings:

Theory, Design of isolated square and rectangular footings subjected to axial load and bending moment (uniform depth only) with detailing of reinforcement

Design of Staircases:

Types of staircase and Design of doglegged Staircase with detailing of reinforcement

Introduction to Earthquake Resistant Design of Structures:

Seismic effects on RCC building, Material behaviour and general principles of earthquake resistant design of structures, ductile detailing of Earthquake Resistant Structures (Numerical examples are not expected)

Text Books:

1. Reinforced Concrete Design, Pillai S. U. and Menon Devadas, 3rd Edition, Tata Mc Graw Hill, New Delhi
2. Illustrated Reinforced concrete Design, Shah V. L and Karve S. R., 3rd Edition, Structures Publishers, Pune

Reference Books:

1. Design of Concrete Structures, Nilson A. H., Darwin D. and Dolan C. W, 3rd edition Tata Mc Graw Hill, New Delhi
2. Fundamentals of Reinforced concrete design, M. L. Gambhir, Prentice Hall of India Private Ltd., New Delhi
3. Limit State Designs of Reinforced Concrete, Varghese P.C., 2nd Edition, Prentice – Hall of India Learning, New Delhi
4. Fundamentals of reinforced concrete, N. C. Sinha and S. K Roy, 4th Edition S. Chand Publishers
5. Reinforced concrete design, N. Krishna Raju and R. N. Pranesh, 8th Edition New Age International Publishers, New Delhi
6. BIS:456, "Plain and Reinforced Concrete - Code of Practice", BIS, New Delhi.
7. BIS:875, (Part I to V), "Code of Practice for Design Loads (other than earthquake) for Buildings and Structures", BIS, New Delhi.
8. SP 16, "Design aids for reinforced concrete to IS 456", BIS, New Delhi.
9. BIS 1893 (Part 1), "Criteria for Earthquake Resistant Design of Structures"
10. BIS 13920, "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces-Code of Practice"
11. SP 24 "Explanatory Handbook of Indian standard code of practice for plain & reinforced concrete", BIS, New Delhi 11
12. SP34 "Handbook on concrete reinforcement & detailing (with amendment 1)", BIS, New Delhi.
13. https://nptel.ac.in/courses/105/105/105105104/
14. https://www.youtube.com/channel/UCmE0iFn9Hk8sxMBsOz4EnyQ

Course Outcomes:

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

CEU621.1: recognize general structural behaviour of RCC structural elements;

CEU621.2: analyze and design one way slab , two way slab and dog legged staircase slab with detailing of reinforcement as per relevant IS codes;

CEU621.3: design rectangular beam, L beam and T beam with detailing of reinforcement as per relevant IS codes;

CEU621.4: design column with footing subjected to axial load, axial load with uniaxial bending & axial load with biaxial bending with detailing of reinforcement as per relevant IS codes;

CEU621.5: identify relevant clauses applicable to earthquake resistant RCC structure as per IS codes.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU621.1	2	3	1	0	0	0	0	0	0	0	0	1	2	3	1
CEU621.2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU621.3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CEU621.4	3	3	3	0	0	0	0.	0	0	0	0	1	3	3	1
CEU621.5	1	3	2	0	0	0	0	0	0	0	0	1	3	3	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU622 ESTIMATING & COSTING

Teaching Scheme: 02 L + 01 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hrs.

Course Objectives:

I. To impart the knowledge of measurement of quantities of various components of Civil Engineering structures
II. To impart the knowledge of specification and rate analysis of various items of civil engineering structures
III. To make students capable of preparing estimates of various Civil Engineering structures as per Specifications and by using current schedule of Rates
IV. To impart the knowledge of valuation of building
V. To impart skill to use software e.g. QuePro for preparing estimates
VI. To impart the knowledge of tendering procedure, various types of contract and contract Document

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Course Contents:

Modes of Measurement:

Modes of Measurement and units of measurement as per IS:1200, Meaning, purpose, and methods adopted for approximate estimation of Civil engineering works. Need of approximate estimate

Types of Estimate:

Approximate estimate and detailed estimate, Various methods of estimation, Stages of estimates, Purpose and principles, importance of schedule of rates in cost estimates. Introduction to S. S. R. Introduction to components of estimates: face sheet, abstract sheet (BOQ), lead statement

Cost and Quantity Estimates:

Detailed Estimate, Forms used, Detailed estimate of various civil engineering structures,
Working out quantities of various items required for construction,
Detailed estimation for Flat roof building,
Detailed estimate of Earth work in roads including hill road,
Detailed estimate of steel reinforcement in RCC works for Slabs, Beams and Columns, Footings, Stair Case etc., bar bending schedule,
Detailed estimation for septic tank, soak pit, sanitary and water supply installations.

Specifications:

Purpose, Necessity and principles of specification writing, Types of specifications, Drafting and writing of detailed specifications of important items of construction

Rate analysis:

Importance and need of rate analysis, Factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost. Performance of rate analysis, Analysis of material and labour requirements, Quantity of materials per unit rate of work, labour estimate, various important terminologies like work charged establishment, contingencies, percentage charges, overheads etc.

Cost Accounting: Various methods, classification of cost, direct and indirect charges, distribution of overheads, MAS account, issue rate of store accounts.

Valuation:

Purpose of valuation, value and cost, market value, potential value, Sentimental value, scrap value etc. Net and gross return, Free hold and lease hold property, Sinking fund, Depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building, time cost relationship, qualifications and functions of a valuer

Introduction to Contracts tendering:

Types of contracts, Tender, Tender documents, tendering procedure, Qualitative and quantitative evaluation of tenders

Text books:

1 Estimating and Costing in Civil Engineering -Theory and Practice, Datta B.N., 23rd Edition, UBS Publisher, New Delhi, 2003
2 Estimating and Costing, Patil B. S., Oriental Longmans Publication, New Delhi
3 Estimating and Costing, R. C. Rangwala, Charotar Publ. House, Anand
4 Estimating, Costing Specifications & valuation in Civil Engineering, M. Chakraborty,

Reference Book:

1. Civil Estimating & Costing: Including Quality Surveying, Tendering and Valuation, Upadhyay A.K., S K Kataria and Sons
2. Theory and Practice of Valuation, Roshan Namavati, Lakhani Publications
3. Valuation Principles and Procedures, Ashok Nain, Dewpoint Publications
4. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New Delhi
5. Construction Cost Estimating: Process and Practices, Leonard Holm, John E. Schaufelberger, Dennis Griffin, and Thomas Cole Pearson Education
6. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New Delhi
7. "State Schedule of Rates" published by Public works Department.
8. Standard Contract Clauses for Domestic Bidding Contracts: Ministry of Statistics and Programme Implementation, Government of India

Course Outcomes (COs):

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

CEU622.1 prepare quantity estimates for buildings and other Civil Engineering structures as per Specifications;

CEU622.2 draft detailed specifications and work out rate analysis for all works related to Civil engineering projects;

CEU622.3 ascertain the quantity of materials required for Civil engineering works as per specifications;

CEU622.4 prepare cost estimate and valuation of civil engineering works.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU622.1	3	0	2	1	0	3	0	0	3	3	3	3	3	3	3
CEU622.2	0	0	3	0	0	2	0	0	3	3	3	3	2	2	3
CEU622.3	3	0	2	1	0	0	0	0	3	3	3	3	3	3	3
CEU622.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVE I
CEU623 (A) STRUCTURAL MECHANICS

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. Student should interpret influence line diagram for indeterminate structures

II. Student should study unsymmetrical bending and shear center

III. Student should learn analysis of curved members

IV. Student should learn torsion and the energy methods of structural analysis.

Course Contents:

Influence line diagram:
Influence Line Diagram for indeterminate structure, Application of Muller Breslau's Principle to propped cantilever and two span continuous beam with simple supports, ILD for reactions, shear force, bending moment and support moment

Introduction to theory of elasticity:
State of stress at point, stress equilibrium equations, strain components, stress-strain relation, generalized Hooke's law, plane stress and plane strain conditions, stress and strain compatibility for 2 D (Treatment in Cartesian coordinates),

Energy Theorem:
Minimum potential principal, Rayleigh & Rayleigh-Ritz method, application to simply supported and cantilever beams using power series and trigonometric series

Torsion:
Saint Venant torsion theory, membrane analogy, torsion of thin walled open section, pure twist of thin walled tubes of one cell and multiple cells,

Beams curved in plan:
Determinate and indeterminate beams curved in plan

Unsymmetrical bending and Shear Centre:
Causes of unsymmetrical bending, bending stresses in unsymmetrical bending, Shear centre of thin sections, shear flow, location of shear centre of thin walled sections

Text Books:

1. Basic Structural Analysis, Reddy C. S., 2nd edition, Tata – McGraw Hill, New Delhi.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc.
3. Design of Steel Structures, Duggal S. K., 3rd Edition, Tata McGraw Hill Publishing Company Limited

Reference Books:

1. Structural Analysis, R. C. Hibbler, 4th Edition, Prentice Hall of India Pvt., Ltd. Publications
2. Theory of Elasticity, Timoshenko, S. P. and Goodid, J. N., 3rd Edition, Tata McGraw-Hill Publishing Co. Ltd.
3. IS 1893:2002, Criteria for Earthquake Resistant Design of Structures, Part I, Bureau of Indian Standards, New Delhi
4. Elementary Structural Analysis, Utku, Norris and Wilbur, 4th Edition, McGraw Hill Inc.
5. Structural Analysis, Jangid R.S. and Negi, Tata McGraw-Hill Publishing Company Limited, New Delhi
6. Structural Analysis, Aslam Kassimali Amit Prashant publisher

Course outcomes:

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

CEU 623(A).1: solve the problem related to plastic analysis of steel structure;

CEU 623(A).2: apply Concept of shear centre to field problem;

CEU 623(A).3: analyse the beam curved in plan;

CEU 623(A).4: apply concept of torsion and energy methods in research field.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU623(A).1	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CEU623(A).2	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CEU623(A).3	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CEU623(A).4	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU623 (B) RELIABILITY ANALYSIS OF STRUCTURES

Teaching Scheme: 03 L + 00 T   Total: 03   Credits: 03
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 2hrs. 30 min.

Course objectives:

I. To make the students familiar with the role of reliability in civil engineering

II. To make the students competent to apply common probabilistic models in reliability analysis of structures

III. To make the students familiar with the fundamental concept of structural reliability

Course Contents:

Role of reliability in civil engineering:
Historical background, random events, random variables, model uncertainty

Common probabilistic models:
Important statistical parameters and their estimations, normal, lognormal, extreme value distribution

Fundamental concept of structural reliability:
Derivation of stress-strength interface equation, graphical representation, Cornel reliability index, reliability and failure probability computations for simple linear functions; Second moment concepts

First order second moment theory:
Hasofer-Lind transformation, Linear and non-linear limit state functions, Solution schemes, geometric interpretation of solution scheme, Rackwitz-Fiessler transformation

First order reliability method:
Stochastic models for material strength and loads, Reliability assessment of structural component and simple civil engineering structures.

Text books:

1. Structural reliability analysis and prediction, Melchers, R. E., 2nd Ed., John Wiley Chichester; New York. Ditlevsen, O., and Madsen, H. O. (2007)
2. Structural Reliability Methods, Internet Edition 2.3.7, John Wiley & Sons, Chichester, UK. http://od-website.dk/books/OD-HOM-StrucRelMeth-Ed2.3.7.pdf

Reference Books:

1. Introduction to random vibrations, N C Nigam, MIT Press, Boston. M. Tech. (Structural Engineering) Department of Civil Engineering, National Institute of Technology, Tiruchirappalli
2. Probability, random variables and stochastic processes, A Papoulis, McGraw-Hill, NY

3. Structural reliability analysis and prediction, R E Melchers, John Wiley, Chichester

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

CEU 623(B).1: apply the knowledge of reliability analysis of structures in civil engineering;

CEU 623(B).2: develop Common probabilistic models in reliability analysis of structures.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU623(B).1	3	3	2	1	0	0	0	0	0	0	0	1	3	1	1
CEU623(B).2	3	3	2	1	0	0	0	0	0	0	0	1	3	1	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU623 (C) GEOGRAPHIC INFORMATION SYSTEM AND SCIENCE

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To impart knowledge to students about knowledge of surveying using advanced technology related with GIS and GPS for carrying out special surveys

Course Contents:

Geographical Information system:

Introduction, Objectives, GIS Architecture (subsystems), Components of GIS, GIS data types, Data models, Data acquisition in GIS, Data processing, Implementation of GIS, Airborne Laser Thematic Mapper (ALTM) LIDAR, Principles and methods of data collection, Digital Elevation Models, GIS Softwares

Global Positioning Systems:

Earth surface datum, Coordinate systems, segments of GPS Systems, GPS receiver and its components, different methods of observations, Surveying with GPS, Co-ordinate transformation, accuracy considerations

Text books:

1. Advanced Surveying: Total Station, GIS and Remote Sensing, Satheesh Gopi, R. Satishkumar and N. Madhu, 1st edition Pearson India,
2. Higher Surveying , Chandra, A.M., New Age International (P) Limited, 2nd edition
3. Surveying, Vol-I, II and III", Arora, K. R., Standard Book House

Reference books:

1. Geomatics Engineering, K. Arora and Badjatia Manoj, Nem Chand & Bros.
2. Remote sensing and Geographical information system, Anji Reddy, M., B.S. Publications
3. Surveying and Levelling", Vol. I and II, Bhavikatti, S. S., I.K. International Publishing House Pvt. Ltd., 1st edition
4. https://nptel.ac.in/courses/105/107/105107062/
5. https://nptel.ac.in/courses/105/108/105108077/
6. https://nptel.ac.in/courses/105/102/105102015/

Course Outcomes:

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

CEU623(C).1 apply knowledge of GIS for carrying out survey and preparation of 3D views of terrains;

CEU623(C).2 apply knowledge of Remote Sensing for carrying out survey and preparation of 3D views of terrains.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU623(C).1	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3
CEU623(C).2	3	0	0	0	2	0	0	0	1	2	1	2	0	2	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU623(D) RAILWAY, TUNNELS AND AIRPORT ENGINEERING

Teaching Scheme : 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme : 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE : 2 hrs. 30 min.

Course Objectives:

I. To make students familiar with railway engineering fundamentals and functions of railway track operations

II. To design geometry of railway track

III. To choose appropriate railway signals as per the requirements of railway track layout

IV. To develop the ability to suggest tunnels and its types

V. To design airport runway

Course Contents:

Railway:
Characteristics of Railway Transport, Classification of Railway, Track standard terminology, track sections in embankment and cutting, engineering survey,
Permanent Way: Requirement, components of permanent way, gauges, coning of wheels, Rail types and functions, defects in rails, Rail failures, Creep of rails, Rail joints, welding of rails, Sleeper and sleeper density, Rail fixtures and fastenings.

Geometric Design of railway track:
Importance of Geometric Design, Gradients, speed, Super-elevation, cant deficiency, Negative super elevation, Grade compensation, Curves,

Points and crossings:

Left and right hand turnouts, Design calculations for turnouts, & crossovers, types of track junctions Stations and yards: Types, functions, facilities and equipment,

Railway signaling: Objects classification and types of signals

Left and right hand turnouts, Design calculations for turnouts, & crossovers, types of track

Modernisation in railways and railway track, High speed tracks

Tunnels:

Necessity, types, tunnel alignment, Size and shape of tunnels, Tunnel lining, drainage, ventilation & lighting of tunnels, Tunneling methods for soft ground and hard ground, method of mucking, drilling, blasting

Airport:

Agencies controlling national and international aviation, Classification of airports, various surveys to be conducted, airport site selection, Airport layout, Airport obstructions: Zoning laws, imaginary surfaces, approach and turning zone, Airport marking, Airport signaling, Airport lighting,

Runway and Taxiway design:

Orientation of runway, wind rose diagram, basic runway length and corrections, runway geometric design standards, drainage, introduction to pavement design, Terminal area, unit terminal concept, Apron, Apron layout, Aircraft parking, Hangers, Runway and taxiway geometric design, Design of exit taxiway, location of exit taxiway

Environmental guidelines for Airport projects

Text Books:

1. A Text Book of Railway Engineering, S. C. Saxena & S. P. Arora, Dhanpat Rai Publications(P) Ltd., New Delhi
2. Airport Planning & Design , Khanna S. K., Arora M. G. , Jain S. S, 6th edition, Nemchand & Bros.
3. Tunnel Engineering , S. C. Saxena, Dhanpat Rai Publications(P) Ltd., New Delhi

Reference Books:

1. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, Prentice Hall of India
2. Transportation Engineering Vol. I & II, V.N. Vazirani & S.P. Chandola ,7th edition, Khanna Publishers, New Delhi
3. A Text Book of Transportation Engineering, S. P. Chandola ,S. Chand & Co., New Delhia

Course Outcome:

After completion of this course, students will be able to:

CEU623(D).1: identify, define and formulate a preliminary railway project;

CEU623(D).2: design geometrically the railway track;

CEU623(D).3: explain the functionalities of track operations and use appropriate signals along the track, stations & yards;

CEU623(D).4: suggest suitable tunnel type for a railway project;

CEU623(D).5: explain the design airport components such as runway & taxiway.

CO – PO – PSO Mapping:

Course	Program Outcomes														
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU623(D).1	2	0	0	3	0	1	2	0	0	0	0	0	1	2	0
CEU623(D).2	2	2	3	0	0	0	0	0	0	0	0	0	1	2	0
CEU623(D).3	1	1	1	2	2	1	3	0	2	2	1	1	2	3	2
CEU623(D).4	1	2	2	2	1	0	3	0	0	0	2	0	2	3	3
CEU623(D).5	0	2	3	2	3	0	2	0	0	0	0	0	2	3	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU623 (E) HYDRAULIC MODELLING

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To make students aquatinted with importance of modelling for engineering purposes;
II. To impart knowledge of modelling, its types and model laws;
III. To make students familiar with computation for creating models for various civil engineering structures

Hydraulic Modelling:
Basics of Hydraulic Modelling, similarity mechanics, model laws, distinction between numerical and hydraulic models, classification of hydraulic modelling, materials used in the model, scale effect, design, construction, operation and interpretation of the results; Role of instrumentation and data processing;

Gravity dominated models:
Modelling of energy dissipaters, overflow spillways, siphon spillways, bridge piers, vortex formation, cavitation, flow induced vibrations;

Gravity friction models:
Pumped flow models, ship models, surge tank models;

Friction dominated models;
River models with fixed and mobile bed; Basin and reservoir models; Tidal models with fixed and mobile bed; estuarine models; harbour and breakwater models, models of offshore structures;

Physical river Models:
(fixed and movable bed models; sectional models, distorted Models), Mathematical models for aggradations, degradation and local scour,
Surface irrigation flow modelling
Hybrid and Analogue models;
Scope and limitations of hydraulic modelling, complementary aspects of numerical and hydraulic modelling

Text Books:

1. Hydraulic Modelling – an Introduction, P. Novak, V. Guinot, A. Jeffrey, D.E. Reeve, T and F Publisher, London
2. Hydraulic Modeling, Lyatkher V. M, John, Wiley Publication, N.Y.

Reference Books:

1. Computational Hydraulics Numerical methods and modeling, Ioana Popescu, IWA Publication, N.Y
2. Theory of Hydraulic Models, M. Selim Yalin, Palgrave Publication, London

Course Outcomes:

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

CEU623(E).1: explain the importance of modelling;

CEU623(E).2: explain various types of models and model laws;

CEU623(E).3: make computations for preparing models for various civil engineering structures.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU623(E).1	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2
CEU623(E).2	3	2	2	2	1	2	2	1	1	3	2	2	2	2	2
CEU623(E).3	3	3	2	2	2	3	2	1	2	2	2	2	2	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVES II
CEU624 (A) ADVANCED DESIGN OF STEEL STRUCTURES

Teaching Scheme: 03 L + 00 T   Total: 03   Credits: 03
EvaluationScheme:30 MSE + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 3 hrs.

Course objectives:

I. To make the students familiar with design of plate girder

II. To inculcate in the students the understanding of behavior and design of beam column

III. To develop students for effective use of the latest industry standard formulae, tables, design aids in the design of steel structures.

Course Contents:
[Designs Using Limit State Method]

Plate girder (welded):
Introduction to plate girder and design concept, design of cross section, curtailment of flange plates, stiffeners, web and flange splice plates and connection

Design of Beam Column:
Concept, general behavior, nominal strength, interaction equations, beam columns subjected to uniaxial & biaxial bending

Design of Industrial building:
Design of special trusses, rafters, purlin, eaves girder, bracings, Gantry girder, gantry column

Transmission Towers:
Introduction, structural configuration, bracing systems, analysis and design as per codal provisions

Foot Bridge:
Introduction to foot bridge, history, design and construction

Text Books:

1. Design of Steel Structures, N. Subramanian, 1st edition, Oxford University Press, New Delhi
2. Design of Steel Structures, Duggal S. K,Tata McGraw Hill Publishing Company Limited, 3rd Edition
3. Foot bridges: construction, design, history, Ursula Baus, and Mike Schlaich, Springer Science & Business Media

Reference Books:

1. Design of steel Structures, Arya AS, and Ajmani J.L., Nem Chand & Brothers, Roorkee
2. Designs of Steel Structures, Raghupati,1st Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi
3. BIS 800-2007, “Code of practice for general construction in steel”, BIS New Delhi

4. BIS 875-1987 (Part I to V), "Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures", BIS, New Delhi

Course Outcomes:

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

CEU 624(A).1: apply the practical concepts for design of the plate girder;

CEU 624(A).2: design the beam column;

CEU 624(A).3: use of the latest industry standard formulae, tables, design aids for the design of steel structures.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU624(A).1	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1
CEU624(A).2	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1
CEU624(A).3	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU624 (B) ADVANCED CONCRETE TECHNOLOGY

Teaching Scheme: 03L + 00 T   Total: 03   Credits: 03
Evaluation Scheme: 30 MSE + +10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 2hrs. 30min.

Course objectives:

I. To inculcate in the students, the understanding of weakness of plain concrete

II. To make the students familiar with the manufacturing and properties of concrete composite and latest development in trend in concrete composites

III. To make the students competent to apply advanced applications of composite materials for field problems

Course Contents:

Special Cement:
Chemical, Mineralogical and physical Characteristic of some of special cement such as Portland Pozzolana Cement

Fiber reinforced composites:
Introduction to Fiber Reinforced Concrete, types of fibers, properties of fibers. Properties of constituent materials, Mix proportion, fixing, casting

Properties of freshly mixed reinforced concrete (fiber concrete):
Workability tests, mechanical properties, Mechanics and mechanism of Fiber Reinforced Concrete

Testing of fiber reinforced concrete:
Under compression, flexure, and shear and bending, Various toughness indices, Stress-strain behaviour, Design aspects of reinforced concrete structures with fibers

Ferro cement:
Introduction, materials used mechanical properties, construction techniques, design in direct tension, and applications merits as structural materials

Silica Fume Concrete:
Introduction, physical and chemical properties of silica physical and chemical properties of silica fume concrete in fresh state, mechanical properties and durability of silica concrete

Polymer Concrete:
Introduction, Classification, properties of constituent materials, polymer impregnated concrete, polymer concrete, application

Special concretes:
Self-compacting concrete, high performance concrete

Text Books:

1. Special Structural Concretes, Rafal Siddiquc, Galgotia Publications Pvt. Ltd.
2. ~~Fiber Reinforced Cement Composites, P. N. Balaguru, S. P. Shah Mc-Graw hill~~

Reference Books:

1. Fiber Cement and Fiber Concrete, D. J Hannant, John Wiley and Sons
2. Fracture Mechanics and Structural Concrete, Bhusan L. Karihal
3. Concrete Technology & Design, R N. Swamy, Surrey University Press

Course Outcomes:

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

CEU 624 (B).1: identify weakness in plain concrete;
CEU 624(B).2: identify properties of concrete composite;
CEU 624(B).3: apply the knowledge of advanced concrete composite materials for field applications.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU624(B).1	1	1	3	1	0	0	2	0	0	0	0	1	3	2	1
CEU624(B).2	1	1	3	1	0	0	2	0	0	0	0	1	3	2	1
CEU624(B).3	1	1	3	1	0	0	2	0	0	0	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU624(C) PHYSICO-CHEMICAL PROCESSES FOR WATER TREATMENT

Teaching Scheme: 03 L+ 00T Total: 03 Credits: 03
Evaluation Scheme: 30 MSE + 10 TA+ 60 ESE Total Marks: 100
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To impart knowledge to students about the various physico-chemical processes treatment processes in general and recent developments in particular

II. To impart knowledge to students about water quality concepts and their effect on water treatment process

III. To make students competent to design of various units of water treatment plant.

Course Contents:

Unit Operations and Unit Processes:

Various unit operations and unit processes, Coordination of unit operations, Flow diagram of conventional WTP, Limitations of conventional treatment, Hydraulic considerations, Common attributes of water affected by conventional unit operation and processes,

Aeration:
Objectives, Types, Factors governing design of aerator, Gas transfer, Rate of gas absorption and desorption, Problems on aeration and design of aerators

Mixing:

Rapid Mixing -Function, Types, Power requirement, Design of flash mixer
Slow Mixing- Flocculation, Objectives, Chemical coagulation, Concept of surface charge, coagulating effects of electrolytes, Zeta potential, Coagulants and coagulant aids, Quantity of coagulants, Factors influencing coagulation, Perikinetic and orthokinetic flocculation, Mixing and stirring devices, Operation of flocculator, Design of flocculator, Pebble bed flocculator,

Sedimentation:
Principle, General equation for settling of discrete particles, Hindred settling, Effect of Temperature, Efficiency of an ideal basin, Short-circuiting, Design and operation of settling tank, Design of Clariflocculator, Inlet and outlet arrangements, volume weight relationship, Sludge removal, settling efficiency of particle, Tube settler and plate settler, High rate solid contact clarifier, Floatation: Principle and working, Chemical precipitation, nature of colloid

Filtration:
Objective, Theories, Rapid and slow sand filters, Operation, Backwashing, Negative head, Filter media, Grain size distribution, Preparation of filter sand, Hydraulics of filtration, hydraulics of fluidized beds, Type of filter, High rate, Constant rate, Decline rate, Up flow,

Dual media, Pressure filters, Diatomaceous earth filter, Under drainage system, Design of slow and rapid sand filters, Design of under drainage system

Disinfection:
Objectives, Requirements of disinfectant, Methods of disinfection, Chemical disinfection, Theory, Kinetics, Factors affecting disinfection, Chlorination: Free and combined chlorine, Residual chlorine, Effect of pH, Contact time, Types of compounds, Types of chlorination, Disinfection in rural water supply

Advanced Treatments:
Water softening: Lime soda process, Quantity of lime and soda, Split process, Zeolite process, Ion exchange; Effect of fluoride, Fluoridation and De-fluoridation, Methods of Iron and Manganese removal, Removal of taste and odour, Removal of dissolved solids, Desalination, Demineralization, Membrane processes, Adsorption: Theory, Applications, Mass transfer zone, Adsorption capacities, Adsorption isotherms

Text Books:

1. Environmental Engineering , H. S. Peavy, D. R. Rowe and T. George, McGraw-Hill Book Company, New Delhi, 1985
2. Water Supply and Waste Water Disposal, Fair G. M. and Geyer J. C., John Wiley and Sons, Inc., New York, 1968

Reference Books:

1. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Government of India Publication, New Delhi, 1999
2. Water Treatment Processes, S. Vigneswaran and C. Visvanathan, CRC Press, Boca Raton, Florida, USA, 1995
3. Environmental Engineering, Gerard Kiely, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007
4. Environmental Engineering, A. P. Sincer and G. A. Sincero, Prentice-Hall of India Private Limited, New Delhi, 2004
5. Water and Waste Water Technology, Mark J. Hammer, 6th edition, John Willy and Sons, 2007
6. Water Supply and Sewerage, E. W. Steel and McGhee, 6th edition, McGraw Hill Company, 1991
7. Physico-Chemical Processes for Water Quality Control, Weber, John Wiley and Sons, 1972

Course Outcomes:

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

CEU624(C).1 explain and apply the concepts of unit operations and processes for physical and chemical treatment of water;

CEU624(C).2 analyze and evaluate the physical and chemical treatment systems used in water;

CEU624(C).3 design physical and chemical treatment systems for water.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU624(C).1	2	2	1	1	2	2	2	1	2	2	2	2	2	2	2
CEU624(C).2	2	3	2	2	2	2	2	2	3	3	2	2	2	1	2
CEU624(C).3	3	3	3	2	3	2	2	2	3	3	2	2	2	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU624 (D) OPEN CHANNEL FLOW

Teaching Scheme: 03 L + 00 T Total: 03 Credits: 03
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To impart knowledge of Flood routing in large channel networks and compound channel;

II. To impart knowledge about river Morphology and measurements in rivers

III. To make acquainted with design river protection and river training works.

Course Contents:

Non-uniform flow through channel:
Derivation of 1-D and 2-D shallow water flow equations;
Consideration for non-hydrostatic pressure distribution;
Latest shock capturing Finite Volume methods for solving 1-D and 2-D shallow water flow equations; Dambreak flow; Flood routing in large channel networks, Flood routing in compound channels; Flood routing in channels with flood plains

River Engineering:
River Morphology (Bars; Bends and Meanders, Thalweg; Braiding; Bifurcations etc.); Sediment Transport Mechanics (Bed forms, Bed Load transport, Transport of suspended sediment, Critical Shear stress, Sediment Transport Equations); Aggradation and Degradation; Local Scour at Bridge Piers and other Hydraulic Structures.
Measurements in Rivers (Stage measurements, Channel geometry, Discharge, Sediment samplers and suspended and bed load measurement), River Protection and Training Works (Revetments, Dikes, Gabions, Spurs, Bank Protective measures and Bed control structures), Design of river training and flood protection structures, Diversion and Cofferdams; River regulations systems; Dredging and Disposal, River restoration

Text Books:
1. Open-Channel Flow, Subhash C. Jain, Wiley Publication
2. Flow in Open Channel, K. Subramanya, Mac Graw Hill publication

Reference Books:
1. Open Channel Flow, Madan Mohan Das, Prentice- Hall of India Publication, New Delhi
2. Open-Channel Hydraulics, A. Osman Akan, Elsevier Publication , U.K
3. Open Channel flow, Hanif Chaudhry, Springer Publication

Course Outcomes:

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

CEU624(D).1: carryout Flood routing in large channel networks, compound channels, and channels with flood plains;

CEU624(D).2: explain River Morphology;

CEU624(D).3: design River Protection and Training Works.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU624(D).1	2	2	2	2	2	1	2	1	2	1	2	2	3	3	2
CEU624(D).2	2	2	2	2	1	2	2	1	1	2	1	2	3	3	3
CEU624(D).3	2	2	3	3	2	3	3	2	2	1	2	2	3	3	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU624 (E) REPAIRS, REHABILITATION AND RETROFITTING OF R.C.C. STRUCTURES

Teaching Scheme: 03 L +00 T **Total: 03** **Credits: 03**
Evaluation Scheme: 30 MSE + + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs. 30 min.

Course Objectives:

I. To make the students aware of assessment of strength and materials deficiency in building structures
II. To impart the students, the ability to suggest methods and techniques used in repairing / strengthening of existing concrete structures
III. To make the students familiar with Non-Destructive Testing techniques and its application to field problems
IV. To make the students competent to apply cost effective retrofitting strategies for repairs in buildings.

Course Contents:

Introduction:
Aging of structures, assessment procedure, causes of deterioration, need for repair and rehabilitation, performance of structures, Inspection, Maintenance

Distress in load bearing, R.C.C., steel structures:
Damage, source, cause, effects of damage, case studies, Effects of climate, temperature, Corrosion, Strength, Durability and Thermal properties of building materials.

Damage assessment and Evaluation methods:
Damage testing methods, Non-destructive Testing Techniques (NDT), destructive testing method, Core samples

Repairing methods and techniques:
Guniting and Shotcreting, grouting, Crack ceiling, Polymer concrete, Fiber wrapping techniques, steel plate flitching, Use of carbon fibre wrapping and carbon composites in repairs. Repair of structures distressed due to corrosion, fire, Leakage, earthquake Case studies.

Retrofitting methods:
Seismic Retrofitting of reinforced concrete buildings, Considerations in retrofitting of 675 structures; Source of weakness in RC frame building, Structural damage due to discontinuous load path, Quality of workmanship and materials, Jacketing

Repair and maintenance of buildings:
IS standards, Bridge repairs, Seismic strengthening, Estimation and costing of repairing techniques such as jacketing, grouting, polymer mortar

Text Books:

1. Diagnosis and treatment of structures in distress, R. N. Raikar, R&D Centre of Structural Designers & Consultants Pvt. Ltd., Mumbai, 1994.
2. Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Ravishankar. K., Krishnamoorthy, Allied Publishers, 2004
3. Diagnosis and treatment of structures in distress, R. N. Raikar, R&D Centre of Structural Designers & Consultants Pvt. Ltd., Mumbai, 1994

References Books:

1. Reinforced Concrete Structures – Vol. II, Dr B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi
2. Concrete Bridge Practice, Analysis, Design and Economics, V. K. Raina, Tata McGraw-Hills Publishing Company Limited.
3. Bridge Engineering, S. Ponnuswamy, Tata McGraw-Hills Publishing Company Limited.
4. Bridge Rehabilitation- A Practitioner's manual, V K Raina, Shroff Publishers, 2018
5. Building Failures – Diagnosis and Avoidance, W H Ranson,
6. Forensic Engineering, Kenneth and Carper, ISBN 9780367411367
7. Handbook on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi.

Course Outcomes (COs):

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

CEU 624(E).1: assesses strength and deficiency in materials in building structures;

CEU 624(E).2: apply methods and techniques for repairing / strengthening of existing concrete structures;

CEU 624(E).3: apply Non-Destructive Testing techniques to field problems;

CEU 624(E).4: apply cost effective retrofitting strategies for repairs in buildings and assist in structural audit of buildings.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU624(E).1	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1
CEU624(E).2	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1
CEU624(E).3	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1
CEU624(E).4	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU625 ENVIRONMENTAL POLLUTION AND CONTROL

Teaching Scheme: 03 L+ 00T Total: 03 Credits: 03
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2 hrs. 30 min

Course Objectives:

I. To introduce the students the various aspects of Environmental engineering in general and recent developments in particular.

II. To acquaint students with various aspects of wastewater engineering problems.

III. To develop competency in students for design of various units of wastewater treatment plant and sewerage system.

Course Contents:

Quantity and Quality of Wastewater

Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal wastewater, First order B.O.D equation, C.O.D, solids, Quantity of storm water, Ground water infiltration. Self-Purification, DO sag curve, Streeter–Phelps equation, Stream classification, effluents standards for stream and land disposal as per MPCB and CPCB standards.

Sewerage system

Sewage, Types of sewerage system, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems Sewage and Sludge pumping, Location, Capacity.

Primary and secondary treatment of wastewater

Flow diagram of conventional STP, Primary Treatment-Screening, Grit removal, Oil and Grease trap, Primary settling tank

Secondary Treatment-Biological treatment methods, its principle, Activated sludge process-process design and operating parameters, modification of ASP, operational problems, Trickling filter- types and design, Secondary Settling Tank-concept and design, Sludge characteristics, Sludge treatment and disposal methods.

Wastewater treatment technologies

Concept of anaerobic digestion, types of reactors. Low cost wastewater treatment methods-Design and operation of oxidation pond, aerobic & anaerobic Lagoons, Oxidation ditch, Septic tank. Selection of alternative Treatment process flow sheets

Air pollution and Noise pollution

Air Pollution-Definition, Sources and classification of pollutants, Effects on man material and vegetation, Introduction to Meteorological aspects such as atmospheric stability, mixing heights, and plume behaviour, Control of industrial air pollution-Theory and working principle of Settling Chamber, Bag Filters, Cyclone separators, Scrubbers, Electrostatic precipitators, Introduction to global issues – Global warming, Acid rain, Ozone depletion, Photochemical Smog. Ambient air quality standards

Noise Pollution-Sources and effect of Noise pollution, Noise characteristics and measurements, Levels of noise and standards, control measures of community and industrial noise

Solid waste management

Solid wastes Definition, Types, Sources, Characteristics, Functional outlines-storage, Collection, Processing techniques, Methods of treatment of solid waste-Composting, Incineration, Pyrolysis, and Sanitary landfilling. Concept of Hazardous waste management

Environmental Impact Assessment

Introduction to Environmental Impact Assessment and Environmental Legislation, Environmental Protection act 1986.

Text Books:

1. Environmental Engineering, Peavey, H. S. and Rowe, D.R., McGraw-Hill Book Company
2. Water Supply & Sanitary Engineering, G. S. Birdie, Dhanpat Rai & Sons, New Delhi
3. Water and Waste water Technology, Hammer M. J., Prentice-Hall of India Pvt Ltd, 7th Edition
4. Sewage Treatment and Disposal and Wastewater Engineering, P. N. Modi, Vol-II, Standard Book house, New Delhi

Reference Books:

1. Water supply and Sanitary Engineering, S. K. Hussain, 3rd edition, CBS Publishers, New Delhi
2. Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, McGraw-Hill Higher Education

2. CPHEEO Manual on sewerage and sewage Treatment, Govt. of India Publication

3. Air Pollution, Rao M. N. and Rao H. V, Tata McGraw Hill

4. CPHEEO Manual on Municipal Solid Waste Management, Ministry of Urban Development, Govt of India

5. Wastewater Treatment plants: Planning, design and operation, Syed R Qusim, CRC Press

6. https://nptel.ac.in/courses/105/104/105104102/

Course Outcomes:

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

CEU625.1: identify key current environmental problems;

CEU625.2: value the effect of the pollutants on the environment: atmosphere, water and soil;

CEU625.3: plan strategies to control, reduce and monitor pollution;

CEU625.4: design various units of wastewater treatment process.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU625.1	3	1	0	0	0	1	3	0	1	0	0	0	2	1	0
CEU625.2	0	3	1 .	3	2	0	0	0	0	1	0	1	1	0	0
CEU625.3	2	1	0	0	0	2	2	2	2	2	3	2	2	2	3
CEU625.4	0	0	3	0	2	2	0	1	0	2	0	0	0	1	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

OPEN ELECTIVES I

CEU626 (A) INTRODUCTION TO CIVIL ENGINEERING

Teaching Scheme: 03 L + 00 T   Total: 03   **Credits: 03**
Evaluation Scheme: 60 ESE   **Total Marks: 60**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To impart the basic knowledge of various fields of Civil Engineering
II. To make students aware of the importance of various components of building
III. To make students familiar with the construction process of building construction
IV. To make students familiar with the various procedural steps to execute civil engineering project
V. To give an understanding to the students about overall field of Civil Engineering

Course Contents:

Basic and History:
Broad disciplines of civil engineering, importance of civil engineering, early constructions and developments over time, ancient monuments & modern marvels, works of eminent civil engineers

Building materials:
Commercial timber, bricks, Precast blocks, mortars, plain and reinforced & prestressed concrete, structural steel, plastics in construction, Advanced building materials

Building components and construction:
Components of a building and their functions, types of structures – load bearing, framed, R.C.C and steel structures, Foundations, types of doors, windows, stairs, floors and floorings, brick masonry, precast concrete blocks masonry, concreting, plastering, plumbing and electrification,

Surveying:
Purpose, Traditional surveying techniques, surveying instruments,

Basics of Hydrology:
Hydrological cycle, rainfall measurement and runoff determination, Hydrological investigations

Basics of Geotechnical Engineering:
Importance soil mechanics, geotechnical engineering problems, various types of foundations and their suitability

Basics of Transportation Engineering:
Types of roads, materials for construction, Transport infrastructure development in India, types of bridges, Railway, Airports, and harbour
Basics of Environmental Engineering: Water treatment systems, waste water treatment, solid waste management

Basics of water resources Engineering:

Water resources available in India and its planning, Types of dams, canals, multipurpose reservoir projects

Civil engineering Project activities:

Site investigations, Planning, Designs, Preparation of drawings, estimates and its types, Preparation of tender documents and awarding contracts

Text Books:

1. A Basic Concept of Civil Engineering, Narayan Sunder, Atlantic Publisher & Distributors (P) Ltd, 2018
2. An Introduction to Civil Engineering, Valdengrave Okumu, Create Space Independent Publishing Platform, 2014

Reference Books:

1. Civil Engineering: A Very Short Introduction, David Muir Wood Oxford University Press, 2014
2. Introduction to Civil Engineering: A Student's Guide to Academic and Professional Success, Sheng-Taur Mau and Sami Maalouf, Cognella, Incorporated, 2014
3. The National Building Code, BIS, (2017)
4. Introduction to Civil Engineering Systems: A Systems Perspective to the Development of Civil Engineering Facilities, Samuel Labi, John Wiley & Sons, 2014
5. Introduction to Infrastructure: An Introduction to Civil and Environmental Engineering, Michael R. Penn and Philip J. Parker , Wiley, 2011

Course Outcomes:

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

CEU626(A).1: explain the importance of various disciplines of civil engineering field

CEU626(A).2: explain basics of surveying, hydrology, geotechnical Engineering and structural engineering

CEU626(A).3: explain the fundamentals of building materials and building construction processes

CEU626(A).4: explain the procedure to complete civil engineering project.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU626(A).1	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(A).2	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(A).3	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(A).4	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU626 (B) PROJECT MANAGEMENT

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme : 60 ESE **Total Marks: 60**
Duration of ESE: 2 hrs. 30 min.

Course Objectives:

I. To introduce project definitions and overview of the subject
II. To aquatint student with the context of project and development of project scope
III. To make students familiar with breakdown work for ease of scheduling and subsequent management processes
IV. To inculcate in the students leadership and its role in human resource development and utilization
V. To make the students familiar with method of earned value management

Course Contents:

Projects:
Definitions & Importance of Project Management (PM), The project manager's role, Project context: Internal and external environment, Project structures – functional, matrix, projectized, PM processes, Knowledge and Subject areas.

Project Environment:
Project Governance, The Project Management Office, Sponsorship, Project Selection, Rationale and business case, Mission, goals and strategy-Organization and projects, Program and Portfolio management, The Charter: Major assumptions and constraints Project Management Plan, Influential Stakeholders.

Project Scope:
Project goals and objectives, Definition of project scope, Definition of project scope, goals, Assumptions, constraints, priorities, requirements, validation and verification, Specification and Design, Constraints, limits, assumptions, and technical requirements, Statement of Work (SOW).

Work Breakdown Structure (WBS):
Decomposition of scope, Work Breakdown Structure (WBS),Brief overview, Benefits of using WBS, WBS structure, WBS Dictionary, WBS formats – Chart, tabular and free formats (mind map), Graphical vs. Outline Work Packages, Design of WBS, Relationship of WBS to other processes.

Human Resources:
Organizational structures, Geographical structure by product etc. Basics of Team organization, Select team, build team, manage team, Feedback, coaching, etc. Making decisions & Leadership, Motivation, Resolving conflicts, Labor regulations

Earned Value:

Establishing the measurement of planned versus actual, S-curves & Cumulative values, Planned value, earned value and actual cost, Cost and Schedule Performance Indices, Variances, Interpretation, Estimates at completion Cost & schedule analyses

Resource Planning and Scheduling: Critical path theory and application, Construction Scheduling, activity cost and time estimation in CPM, PERT

Text books:

1. Project Management – a managerial approach, Meredith J.R. and Mantel S.J., 6th edition, New Delhi, Wiley, (2005)
2. Project Management- Planning, analysis, selection, implementation and Review, Chandra, Prasanna, 7th edition, New Delhi, Tata McGraw Hill, (2009)
3. Project Management. Planning and Control Techniques, Burke R., John Wiley & Sons, 2006

Reference books:

1. Operations Management, Slack, Nigel, Chambers, Stuart, Harland and Johnston, A.J., 2nd edition, USA, PITMAN, (2007)
2. The Implementation of Project Management: The Professional's Handbook, Stucken, L.C., USA, Addison-Wesley, (2005).
3. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide)

Course Outcomes:

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

CEU626(B).1 implement project fundamentals to identify and develop the organisational environment necessary for project formulation;

CEU626(B).2 define, determine and change scope of a project;

CEU626(B).3 develop WBS structure for a given project;

CEU626(B).4 identify right leadership traits to develop human resources;

CEU626(B).5 evaluate the value earned by a project at any phase.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU626(B).1	0	0	0	0	0	3	2	1	0	0	0	0	2	0	3
CEU626(B).2	1	2	2	0	2	0	0	0	0	0	0	0	2	0	2
CEU626(B).3	0	0	0	0	0	2	0	1	3	2	0	0	1	0	2
CEU626(B).4	0	3	0	2	2	0	0	0	0	0	2	0	2	1	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU626(C) CONSTRUCTION TECHNIQUES

Teaching Scheme: 03 L + 00 T   Total: 03   Credits: 03
Evaluation Scheme: 60 ESE   Total Marks: 60
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To impart the knowledge to non -civil engineering students about role of civil engineering field in the developing and developed countries

II. To impart the knowledge to non -civil engineering students the various construction techniques in Civil Engineering.

III. To impart the knowledge to non -civil engineering students the various construction equipment, plant and machinery required for construction processes in Civil Engineering

Course Contents:

Civil engineering Project activities:
Site investigations, Planning, Designs, Preparation of drawings, estimates and its types, Preparation of tender documents and awarding contracts

Building materials: Commercial timber, bricks, concrete blocks, mortars, plain and reinforced & prestressed concrete, structural steel, plastics in construction,

Building components and Types of structures:
Components of a building and their purposes and types, foundations, walls, columns, roofs, doors, windows, Vertical transport in structures- Staircases: parts and type of stairs, Building finishes, Types of structures – load bearing, framed, steel structures, composite structures

Construction Practices:
Specifications, details and sequence of activities and construction co-ordination, Site Clearance, Marking, Earthwork, dewatering, Masonry: stone masonry, Brick masonry, Terms used in brick masonry, Bonds in masonry, concrete block masonry, flooring, concreting, plastering, painting, damp proof courses, construction joints, expansion joints, Fabrication and erection of steel trusses, plumbing and electrification

Special treatments:
Damp proofing; causes and effect of dampness, materials and methods of damp proofing
Sound proofing and acoustics
Termite proofing: pre and post construction treatment,
Thermal insulation, methods of thermal insulation, thermal insulation of roofs and exposed walls
Fire protection- characteristics of fire-resisting materials

Construction equipments, plant and machinery:
Types of earthwork equipment - Selection of equipment for earth work, Equipment for

compaction, Equipment for concreting, Equipment for material handling and erection of structures, – types of cranes, Equipment for dredging, trenching, tunneling, Shoring, underpinning, scaffolding, form work,

Construction techniques for special structures such as slip forming and other special formwork systems for high-rise buildings,

Routine maintenance of buildings and structures

Text Books:

1. A Basic Concept of Civil Engineering, Narayan Sunder, Atlantic Publisher & Distributors (P) Ltd, 2018
2. An Introduction to Civil Engineering, Valdengrave Okumu, Create Space Independent Publishing Platform, 2014
3. Civil Engineering: A Very Short Introduction, David Muir Wood, Oxford University Press, 2014

Reference Books:

1. The National Building Code, BIS, (2017)
2. Introduction to Civil Engineering Systems: A Systems Perspective to the Development of Civil Engineering Facilities, Samuel Labi, John Wiley & Sons, 2014
3. Introduction to Infrastructure: An Introduction to Civil and Environmental Engineering, Michael R. Penn and Philip J. Parker, Wiley, 2011
4. Introduction to Civil Engineering: A Student's Guide to Academic and Professional Success, Sheng-Taur Mau and Sami Maalouf, Cognella, Incorporated, 2014.

Course Outcomes:

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

CEU636(C).1: explain various Civil Engineering Project activities; various construction materials and its use in construction;

CEU636(C).2: explain components of buildings, their functions and types;

CEU636(C).3: explain various construction processes involved in a construction project;

CEU636(C).4: apply theoretical and practical aspects of construction techniques in construction project;

CEU636(C).5: identify the role of other engineering fields in the construction process of civil engineering projects.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU626(C).1	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(C).2	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(C).3	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(C).4	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1
CEU626(C).5	0	0	0	0	0	0	0	0	0	2	1	3	0	0	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU627 DESIGN OF REINFORCED CONCRETE STRUCTURES LAB

Teaching Scheme: 02 P | **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE | **Total Marks: 50**

Course Objectives:

I. To inculcate in the students, the understanding of the general mechanical behaviour of reinforced concrete structure

II. To make the students familiar with relevant IS codes related to reinforced concrete design;

III. To impart the students, the ability to analyse, design and draw structural drawing of single storey RCC framed building with various reinforced concrete structural members according to relevant IS codes;

Practical Work:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

PART I:

Analysis and Design of different structural elements of a single storey building:

1. Design of simply supported slab
2. Design of cantilever slab
3. Design of one-way continuous slab
4. Design of two-way slabs having different boundary conditions
5. Design of beams for different support conditions such as simply supported, Fixed, continuous, and different types such as rectangular (singly/doubly), and Flanged beams(T-beam/ L-beams)
6. Design of Columns (Axially loaded, uniaxially and biaxially eccentrically loaded).
7. Design of Column footings (Axially loaded, uniaxially and biaxially eccentrically loaded)
8. Design of dog-legged stair

A lab report consisting of manual designs of a single storey RCC building & related structural drawings using AutoCAD shall be submitted by each student.

PART II: Field Visit:

Field visit to any RCC framed structure under construction & submission of the report based on site visit including copy of structural drawings and schedule of reinforcement collected from site.

Assessment of Practical

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on design problems and site visit.

Course Outcomes:

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

CEU627.1: calculate the load and design forces in various structural elements of RCC building;

CEU627.2: design structural elements using relevant IS codes along with detailing of reinforcement;

CEU627.3: submit a technical report on construction site visit.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU627.1	2	3	3	0	1	0	0	0	2	0	0	2	3	3	2
CEU627.2	2	3	3	0	3	0	0	0	2	0	0	2	3	3	2
CEU627.3	0	0	0	0	3	0	0	0	3	2	0	1	3	1	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU628 ESTIMATING AND COSTING LAB

Teaching Scheme: P - 04 **Total: 04** **Credits : 02**
Evaluation Scheme: ICA 50 + ESE 25 **Total Marks: 75**

Course Objective:

I. To develop the skill of measurement of quantities of various components of civil Engineering structures

II. To develop the skill of drafting of specifications and rate analysis of various items of civil engineering structures

III. To make students competent for preparing estimates of various Civil Engineering Structures as per specifications and by using current schedule of Rates

IV. To develop skill of using software e.g. QuePro for preparing detailed estimates.

V. To make students competent for preparing valuation of buildings

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

PART I:

1. Drafting of Detailed Specifications for any SIX items of construction
2. Detailed estimate of a single / double storied residential building with minimum four rooms with flat roof (Separate data may be given to each student)
3. Detailed estimate of any one type of bituminous road of minimum 1 km length hcluding earthwork, sub-base and base course
4. Detailed estimate of <u>any two</u> of the following:
   a) Septic tank for a colony,
   b) R.C.C framed structure residential building,
   c) Slab Culvert,
   d) A factory shed with steel frame,
   e) Underground Water Tank,
   f) Road/Railway track/Runway
5. Analysis of Rates for any SIX items of works
6. Problems based on valuation of existing residential building. (any 2)
7. Working out quantities of steel reinforcement for a column footing, column, beam and slab by preparing bar bending schedule

8. Collecting minimum 3 tender notices for Civil Engineering works and drafting a tender notice from given data

PART II:

1. Study of Qe-Pro software/ Bentlay Software and preparation of detailed estimate of building (in practical no. 2 of Part I) using the software

A Lab Report based on above experiments shall be submitted by each student.

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats

ESE: The End Semester Examination for Practical shall be based on the oral / practical examination based on term work.

Course Outcomes (COs):

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

CEU628.1 prepare quantity estimates for Buildings and other Civil Engineering structures as per Specifications and current schedule of rates of PWD;

CEU628.2 draft detailed specifications and work out rate analysis for items of works related to civil engineering projects;

CEU628.3 determine the quantity of materials required for Civil engineering works as per specifications;

CEU628.4 prepare cost estimate and valuation of civil engineering works.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU628.1	3	2	2	2	2	2	0	0	1	2	3	3	3	3	2
CEU628.2	2	0	3	0	0	2	0	0	3	3	3	3	3	2	3
CEU628.3	3	2	2	1	0	0	0	0	3	3	3	3	3	3	3
CEU628.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU629 ENVIRONMENTAL POLLUTION AND CONTROL LAB

Teaching Scheme: 02 P | **Credits: 01**
Evaluation Scheme: 25 ICA+25 ESE | **Total Marks: 50**

Course Objectives:

I. To introduce the students the basic concepts of determination of various parameter of water and wastewater

II. To acquaint students with various laboratory experiments and decide appropriate technology to treat water and wastewater

III. To make students competent to design various treatment units of wastewater treatment plant.

Practical Work:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

PART I: The following is the representative list of laboratory practical, minimum 08 experiments should be conducted.

1. Determination of pH of water and wastewater sample
2. Determination of Turbidity of water sample
3. Determination of Hardness of water sample
4. Determination of chlorides of water sample
5. Determination of of Acidity and Alkalinity of water sample
6. Determination of sulfate content in water / waste water
7. Determination of optimum dose of coagulant by Jar test
8. Determination of DO of water and wastewater sample
9. Determination of BOD of wastewater sample
10. Determination of COD of wastewater sample
11. Determination of solids of water and Wastewater sample
12. Determination of Sludge Volume Index of wastewater sample
13. Determination of RSPM of air sample by using High Volume Sampler

PART II: Design Problems: Designs of any FIVE treatment units of conventional Sewage Treatment Plant

PART III: Field visit to WTP / STP: Visit report shall consist of layout of plant, design details such as flow, size etc. along with sketches/drawing of each unit. (based on information collected during visit)

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on practicals / designs.

Course Outcomes:

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

CEU629.1: determine various parameters of water and wastewater sample;

CEU629.2: design various units of wastewater treatment plant;

CEU629.3 write a technical report on WTP or STP based on information collected during site visit.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU629.1	3	0	0	2	0	1	0	0	0	0	0	0	2	1	0
CEU629.2	0	1	0	0	2	0	0	0	0	0	0	1	1	1	0
CEU629.3	0	0	2	0	0	2	2	2	1	2	1	0	0	2	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVE II LABS

CEU630 (A) ADVANCED DESIGN OF STEEL STRUCTURE LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks: 50**

Course objectives:

I. To develop students for planning and design of plate girder and gantry girder
II. To develop students for design of beam column

Course Contents:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

Part I

A Lab report & Structural drawings (using AutoCAD) of at least two designs from following list of practical's.

1. Design of industrial building components like truss, rafters, purlin, eaves girder, bracings gantry girder, gantry column
2. Design plate girder (welded connection): design of cross section, curtailment of flange plates, stiffeners, web and flange splice plates and connection
3. Design of beam column subjected uniaxial & biaxial bending
4. Analysis and design of transmission tower using software/manual

Part II

Field visits on Steel Structures / Industrial buildings/ / Bridges/ transmission towers & report of the visits.

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on design problems and site visit.

Course Outcomes:

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

CEU 630(A).1: analyse and design components of steel structures as per IS specifications;

CEU 630(A).2: prepare steel structural detailing using any drafting software.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU630(A).1	3	3	2	1	0	0	0	0	3	0	0	1	3	2	1
CEU630(A).2	3	3	2	1	0	0	0	0	3	2	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU630 (B) ADVANCED CONCRETE TECHNOLOGY LAB

Teaching Scheme: 02 P **Credits: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course objectives:

I. To inculcate in the students the competency to execute various tests on various types of concrete and interpret the results of tests

II. To make students aware of manufacturing and properties of concrete composite

List of Experiments:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

Designs of fiber reinforced concrete and special concrete with any six following tests:

1. Stress strain curve for concrete
2. Correlation between cube strength and cylinder strength
3. Determination of split tensile concrete
4. Determination of modulus of rupture concrete
5. Correlation between compressive strength and cylinder strength
6. Relation between compressive and modulus of rupture
7. Behavior of beams under flexure
8. Behavior of beams under shear
9. Behavior of beams under torsion
10. Slump flow test for self-compacting concrete

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on practicals conducted

Course Outcomes:

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

CEU 630(B).1: execute various tests on various types of concrete;

CEU 630(B).2: interpret results from various tests on concrete.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU630(B).1	1	1	2	0	0	0	0	0	3	0	0	1	3	2	1
CEU630(B).2	1	1	2	1	0	0	0	0	3	2	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU630(C) PHYSICO-CHEMICAL PROCESSES FOR WATER TREATMENT LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To impart knowledge to students about the various aspects of design of water treatment units in general and recent developments in particular

II. To equip students with knowledge of water treatment processes for various applications in Civil engineering

III. To design various units of water treatment plant

It is representative list of practical's. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

Practical Work:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

Part A: Problems on design of various individual treatment units (Minimum Five)

1. Design of aeration fountain
2. Design of flocculator
3. Design of sedimentation tank
4. Design of rapid sand filter
5. Design of under drainage system for filter
6. Computation of head loss through filter bed
7. Design of tube settler
8. Design of water softener
9. Calculation of quantity of lime and soda requirement for water softening

Part B:

Design of conventional water treatment plant for a given population along with hydraulic computations, layout plan, sectional elevation etc

A Report based on above shall be submitted by each student.

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on practicals conducted

Course Outcomes:

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

CEU630(C).1 plan water treatment units and identify current water treatment processes;

CEU630(C).2 analyse the data required for design of water treatment plant;

CEU630(C).3 design physical and chemical treatment systems for water treatment plant.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU630(C).1	2	2	1	1	2	2	2	1	2	2	2	2	2	1	2
CEU630(C).2	2	3	2	2	2	1	2	2	2	3	2	2	2	1	2
CEU630(C).3	3	3	3	2	3	2	2	2	3	3	2	2	2	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU630 (D) OPEN CHANNEL FLOW LAB

Teaching Scheme: 02 P | **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE | **Total Marks: 50**

Prerequisites: Basic knowledge Hydraulic Engineering and Fluid Mechanics and River Engineering

Course Objectives:

I. To make students familiar with carrying out Flood routing in large channel networks, compound channels, and channels with flood plains;

II. To make students squinted with design river protection and river training works;

It is representative list of practical's. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

Practical Work: List of practicals

1. Solution to 1-D and 2-D shallow water flow equations.
2. Flood routing in large channel networks
3. Flood routing in compound channels
4. Flood routing in channels with flood plains
5. Design of River Protection Works
6. Design of River Training Works
7. Design of Diversion and Cofferdams

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on term work.

Course Outcomes:

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

CEU630(D).1: carryout Flood routing in large channel networks, compound channels, and channels with flood plains;

CEU630(D).2: carryout Design of river protection and river training works;

CEU630(D).3: carryout Design of Diversions and Cofferdams.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU630(D).1	3	2	2	2	2	1	2	1	1	1	1	1	2	2	1
CEU630(D).2	3	2	2	2	2	1	2	1	2	1	1	1	2	2	1
CEU630(D).3	3	3	3	2	2	1	2	1	2	1	2	1	2	3	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU630 (E) REPAIRS, REHABILITATION AND RETROFITTING OF R.C.C. STRUCTURES LAB

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Objectives:

I. To develop students to apply destructive, partial destructive and Non-Destructive Testing techniques to field problems
II. To develop students to perform various destructive, partial destructive and Non-Destructive Testing techniques to assess the quality of concrete

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

Performance of minimum six tests/techniques for original and repaired/rehabilitated structural elements

1. Rebar locater
2. Ultrasound pulse velocity meter
3. Corrosion analyser
4. Rebound hammer
5. Impact eco method
6. Core extraction for compressive strength test
7. Slab impulse response
8. Chemical test
9. Other destructive test

Assessment of Practical:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

ESE: The End Semester Examination for Practical shall be based on the oral examination on practicals conducted.

Course Outcomes (COs):

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

CEU 630(E).1: apply destructive, partial destructive and Non-Destructive Testing techniques to field problems.

CEU 630(E).2: perform various destructive, partial destructive and Non-Destructive Testing techniques to assess the quality of concrete

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU630(E).1	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1
CEU630(E).2	3	3	2	1	0	0	0	0	0	0	0	1	3	2	1

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CEU631 MINOR PROJECT

Teaching Scheme: 02 P **Credits: 01**
Evaluation Scheme: 25 ICA **Total Marks: 25**

Course Objectives:

I. To inculcate in the students, knowledge and skills of identifying a technical problem /issue related with Civil Engineering structures, their design, construction methods;

II. To inculcate in the students, knowledge and skills of identifying a social problem /issue related with Civil Engineering and finding its solution ;

III. To equip students with knowledge for finding solutions to technical problems by conducting lab experiments.

Practical Work:

Any one of the following group project (A, B, C ,D and E) may be selected

A. Students should conduct a detailed survey for five to seven days period in a survey camp at a suitable site for a civil Engineering Project for Data collection & analysis, related Design and submit the report and related drawings based on the any of the following project:

i. **Irrigation Project**: Tank basin survey, contour map, area-capacity curve.

ii. **Minor Irrigation Project:** Collection of data for Minor Irrigation scheme such as Bandhara scheme, design of scheme and preparation of drawings

iii. **Water Supply Project**: Data collection for water requirement, selection of source, design of intake fixing alignment of rising main and profile levelling, design of rising main, selection of site for treatment plant, block contouring for treatment plant, fixing alignment of pure water rising main and profile levelling, fixing the location of ESR and block contouring of the site, survey for distribution network, design of distribution of network

iv. **Sewerage system project**: Data collection for sewage quantity, fixing alignment of sewers and profile levelling, design of sewers, selection of site for sewage treatment plant, block contouring for treatment plant, preliminary design

v. **Bridge Project:** Hydrological Data collection for project, fixing the location of bridge, River survey at bridge site, preliminary design of bridge.

vi. **Road Project:** Road project of 1 km length including contouring, fixing alignment, design of curves, road geometric design, estimating quantity and cost of project.

B. Public/Society related problem such as Water supply Problem, Irrigation Management problem, Problems related to construction of defective roads and their poor maintenance etc.

The problem should be identified with the help of parent Department such as Water Recourses Department, Jivan Pradhikaran, Public Works Department etc and Project may be taken up to provide the solution to the same with the help of Industrial expert from the parent Department.

C. Finding solution to a technical problem related to Civil Engineering

The problem should be identified either from a literature review or discussing with guides. Project may be taken up to provide the solution to the same by conducting experimental investigations of limited extent.

D. Design of small Civil Engineering structure

The problem should be consists of planning, design, preparation of drawings, preparation of estimates and tendering documents from the available data for a small Civil engineering structure/project such as 3-4 storied residential building, minor irrigation scheme, Rural water supply scheme, rural drainage and sewage collection scheme, rural road project under Pradhan Mantri Gram Sadak Yojana (PMGSY), Planning for a rehabilitation of village affected due to land acquisition.

E. Minor project related to any field / area of Civil Engineering

A Report based on above study shall be submitted by group of students

Assessment of Practical:

ICA: Two members committee (out of which one member shall be guide) shall evaluate the performance of students. The Internal Continuous Assessment shall be based on

i) participation of students in group activity,

ii) leadership qualities i.e to accept responsibility to lead the group of students and take the responsibilities

iii) Report writing and timely submission of report,

Dean
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iv) knowledge /skill acquired

v) Presentation of results

Course Outcomes:

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

CEU631.1: carry out investigations and collect data for planning and designing of small Civil engineering projects;

CEU631.2: identify a technical problem /issue related with Civil Engineering structures, their design, and construction methods;

CEU631.3: identify social problem /issue related with Civil Engineering and finding its solution;

CEU631.4: find solutions to technical problems by conducting lab experiments.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU631.1	3	2	3	3	2	3	2	1	3	3	2	2	3	3	3
CEU631.2	3	2	3	3	2	3	2	1	3	3	2	2	3	3	3
CEU631.3	3	2	3	3	2	3	2	1	3	3	2	2	3	3	3
CEU631.4	3	2	3	3	2	3	2	1	3	3	2	2	3	3	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

S. W. Thakare
Member Secretary
BoS (Civil)
G.C,.o.E.A.

Dr. S. P. Tatewar
Chairman
BoS (Civil)
G. C. o. E. A.

GOVT. COLLEGE OF ENGINEERING AMRAVATI

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM

For

B. TECH. (Civil Engineering)

2019 – 20

1. **Program Educational Objectives (PEOs)**

  - Civil Engineering Graduate will be able to identify, formulate, and solve Civil Engineering problems
  - Civil Engineering Graduate will be able to deliver the professional and ethical responsibilities
  - Civil Engineering Graduate will be able to communicate effectively to function within multidisciplinary teams
  - Civil Engineering Graduate will have capability and spirit of lifelong learning to cope up with global trends.

B. Tech. (Civil Engineering)

SEM -III

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Basic Science Course	SHU321A SHU 322A	Differential Equations and Probability *Integral Calculus and Probability	3	-	-	3	30	10	60	-	-	100	3
Professional Corecourses	CEU321	Fluid Mechanics	3	-	-	3	30	10	60	-	-	100	3
Professional Corecourses	CEU322	Building Materials and Construction	3	-	-	3	30	10	60	-	-	100	3
Professional Corecourses	CEU323	Solid Mechanics	3	-	-	3	30	10	60	-	-	100	3
Mandatory courses (noncredit)	SHU323	Introduction to Constitution of India	1	-	-	-	-	20	30	-	-	50	0
Professional Core courses	CEU324	Engineering Geology	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU325	Building Materials and Construction Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU326	Engineering Geology Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU327	Solid Mechanics Lab	-	-	2	2	-	-	-	25	25	50	1
		Total	**16**	**00**	**06**	**21**	**150**	**70**	**330**	**75**	**75**	**700**	**18**

**For Direct Second Year Admitted Students*

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM -IV

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core courses	CEU421	Hydraulic Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU422	Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU423	Transportation Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU424	Concrete Technology	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU425	Hydrology & Water Resources Engineering	3	-	-	3	30	10	60	-	-	100	3
Basic Science	SHU422	Environmental ~~Science~~ Studies	1	-	-	-	-	20	30	-	-	50	0
Professional Core courses	CEU426	Hydraulic Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU427	Surveying Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU428	Transportation Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU429	Materials, Testing & Evaluation Lab	-	-	2	2	-	-	-	25	25	50	1
Basic Science	SHU425	Human Values and Ethics	1	-	-	1	-	20	30	-	-	50	0
		Total	**17**	**00**	**08**	**24**	**150**	**90**	**360**	**100**	**100**	**800**	**19**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM- V

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU521	Theory of Structures	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU522	Geotechnical Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU523	Water Supply Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU524	Design of Steel Structures	3	-	-	3	30	10	60	-	-	100	3
Professional Core Course	CEU525	Advanced Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU526	Building Planning & Drawing	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU527	Geotechnical Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU528	Design of Steel Structures Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU529	Building Planning & Drawing Lab	-	-	4	4	-	-	-	25	25	50	2
Professional Core Courses	CEU530	Advanced Surveying Lab	-	-	2	2	-	-	-	25	25	50	1
	Total		**16**	**2**	**10**	**28**	**180**	**60**	**360**	**100**	**100**	**800**	**23**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM - VI

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU621	Design of Reinforced Concrete Structures	3	0	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU622	Estimation & Costing	2	1	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU623	Program Elective – I	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU624	Program Elective – II	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU625	Environmental Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core Courses	CEU626*	Open Elective I	3	-	-	3	-	-	60	-	-	60	3
Professional Core Courses	CEU627	Design of Reinforced Concrete Structures Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU628	Estimation & Costing Lab	-	-	4	4	-	-	-	50	25	75	2
Professional Core Courses	CEU629	Environmental Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU630	Program Elective – II Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core Courses	CEU631	Minor Project	-	-	2	2	-	-	-	25	-	25	1
		Total	**17**	**01**	**12**	**30**	**150**	**50**	**360**	**150**	**100**	**810**	**24**

*** to be offered for other Departments**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM - VII														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU721	Advanced Theory of Structures	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU722	Foundation Engineering	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU723	Program Elective – III	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU724	Program Elective IV	3	-	-	03	30	10	60	-	-	100	3
Open subjects	CEU725*	Open Elective II	3	-	-	03	-	-	60	-	-	60	3
Professional Core Courses	CEU726	Advanced Theory of Structures Lab	-	-	02	02	-	-	-	25	25	50	1
Professional Core Courses	CEU727	Foundation Engineering Lab	-	-	02	02	-	-	-	25	25	50	1
Professional Core Courses	CEU728	Civil Engineering Software Lab	-	-	04	04	-	-	-	50	-	50	2
Professional Core Courses	CEU729	Project – Phase I	-	-	04	04	-	-	-	100	-	100	2
Professional Core Courses	CEU730	Seminar	-	-	02	02	-	-	-	50	-	50	1
Professional Core Courses	CEU731	Industrial Training / Industrial Visit	-	-	-	-	-	-	-	25	-	25	1
		Total	**15**	**00**	**14**	**29**	**120**	**40**	**300**	**275**	**50**	**785**	**23**

*** to be offered to other Departments**

TA: Teacher's Assessment   MSE: Mid Semester Examination   ESE: End Semester Examination   ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM - VIII													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core Courses	CEU821	Construction Engineering & Management	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU822	Program Elective V	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU823	Program Elective VI	3	-	-	03	30	10	60	-	-	100	3
Professional Core Courses	CEU824	*Project – Phase II	-	-	10	10	-	-	-	100	100	200	6
		Total	**09**	**00**	**10**	**19**	**90**	**30**	**180**	**100**	**100**	**500**	**15**

*A) Project Work in the Institute **OR** B) Industry Internship

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE I CEU623	**PROGRAM ELECTIVE II** CEU624	**PROGRAM ELECTIVE III** CEU723	**PROGRAM ELECTIVE IV** CEU724	**PROGRAM ELECTIVE V** CEU822	**PROGRAM ELECTIVE VI** CEU823
1. Structural Analysis 2. Reliability Analysis of Structures 3. Geographic Information Systems and Science 4. Railway, Tunnel & Airport Engineering 5. Hydraulic Modelling	1. Advanced Design of Steel structures 2. Advanced Concrete Technology 3. Physico-Chemical Processes for Water Treatment 4. Open Channel Flow 5. Repairs and Rehabilitation of structures	1. Computer Methods in Structural Analysis 2. Masonry Structures 3. Solid and Hazardous waste management 4. Intelligent Transportation System 5. Infrastructure Planning & Management	1. Structural Dynamics 2. Prestressed Concrete 3. Air and Noise pollution control 4. Ground Improvement Technology 5. Port, Harbour and Bridge Engineering	1. Finite Element Method 2. Advanced Design of Concrete Structures 3. Construction Project Planning & System 4. Industrial Pollution and Control 5. Advanced Foundation Engineering	1. Earthquake Engineering 2. Industrial structures 3. Design of Hydraulic Structures/Irrigation Engineering 4. Pavement Material, Design and Construction 5. Geotechnical Investigation and Construction Practices

LIST OF OPEN ELECTIVES

OPEN ELECTIVE I CEU626	**OPEN ELECTIVE II** CEU725
1. Introduction to Civil Engineering 2. Project Management 3. Construction Techniques	2. Industrial Building Planning & Design 3. Interior Designs and Drawing 4. Environmental Legislation 5. Disaster Management

COMPARISON OF SEMESTER-WISE CREDIT DISTRIBUTION IN OLD AND PROPOSED STRUCTURE

SEMESTER	CREDITS IN OLD CURRICULUM	CREDITS IN PROPOSED CURRICULUM
I	23	21
II	23	21
III	23	18
IV	23	19
V	23	23
VI	23	24
VII	23	23
VIII	23	15
Total	184	164

Equivalence of Second Yr. B. Tech Subjects

As per Previous structure		Equivalence As per Revised Structure w.e.f 2020-21	
Course Codes	**Name of Course**	**Course Codes**	**Name of Course**
	III Semester B. Tech		
SHU 301	Engineering Mathematics III	SHU321A	Transforms and Discrete Mathematics
CEU 301	Engineering Geology and Hydrology Lab		NIL #
CEU 302	Fluid Mechanics	CEU321	Fluid Mechanics
CEU 304	Building Construction and Materials	CEU322	Building Materials and Construction
CEU 303	Strength of Materials	CEU323	Solid Mechanics
CEU308	Building Construction and Materials Lab	CEU325	Building Materials and Construction Lab
CEU 305	Engineering Geology and Hydrology Lab	CEU326	NIL #
CEU 307	Strength of Materials Lab	CEU327	Solid Mechanics Lab
	IV Semester B. Tech		
CEU 405	Open Channel Flow and Hydraulic Machines	CEU421	Hydraulic Engineering
CEU 403	Surveying	CEU422	Surveying
CEU 402	Transportation Engineering	CEU423	Transportation Engineering
CEU 404	Concrete Technology	CEU424	Concrete Technology
CEU 409	Open Channel Flow and Hydraulic Machines Lab	CEU425	Hydraulic Engineering Lab
CEU 407	Surveying Lab	CEU426	Surveying Lab
CEU 406	Transportation Engineering Lab	CEU427	Transportation Engineering Lab
CEU 408	Concrete Technology Lab	CEU428	Materials, Testing & Evaluation Lab

Since in Revised Curriculum, Engineering Geology and Hydrology are proposed two distinct courses.

Member Secretary
BoS Civil Engineering

Chairman
BoS Civil Engineering

Equivalence B. Tech. Second Year SH Courses A.Y. 2020-21

S.N.	Course in old scheme			Equivalent course in new Scheme		
	Course Code	Course name	No. of Credits	Course Code	Course name	No. of Credits
1	SHU301	Engineering Mathematics- III	03	SHU321A	Differential Equations And Probability	03
2		No Equivalence		SHU322A	Integral Calculus And Probability	03
3	SHU304	Engineering Mathematics- III	03	SHU321B	Transform And Linear Algebra	04
4		No Equivalence		SHU322B	Differential Equation And Transform	04
5	SHU303	Engineering Mathematics- III	03	SHU321C	Transform And Statistical Methods	04
6		No Equivalence		SHU322C	Integral Calculus And Probability	04
7		No Equivalence		SHU323	Introduction To Constitution Of India	00
8		No Equivalence		SHU324	Effective Technical Communication	03
9		No Equivalence		SHU325	Human Values And Ethics	00
10	SHU203	Environmental Studies	03	SHU422	Environmental Studies	00
11		No Equivalence		SHU425	Human Values And Ethics	00
12		No Equivalence		SHU525	Human Values And Ethics	00
13		No Equivalence		SHU725	Human Values And Ethics	00
14	SHU305	General Proficiency- II	2		No Equivalence	
15	SHU401	Engineering Mathematics- IV	3		No Equivalence	
16	SHU402	Engineering Mathematics Lab	2		No Equivalence	
17	SHU403	Engineering Mathematics Lab	2		No Equivalence	

Gulhane
F/ **Head, Mathematics**

Member secretary
BoS Science & Humanities

Chairman
BoS Science & Humanities

2

III - Sem B.Tech Civil

SHU321A DIFFERENTIAL EQUATIONS ANDPROBABILITY

Teaching Scheme: 03Th+ 00Tut =00 Total **Total Credits: 03**
EvaluationScheme:30MSE+60ESE+10TA **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

1. To introduce the solution methodologies for second order Partial Differential Equations.
2. To study applications of partial differential equations in vibration of string and heat flow.
3. To equip students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
4. To introduce different sampling distributions and hypothesis tests.

Laplace Transform: (10 hours)
Definition, Properties of Laplace Transform, Laplace transform of periodic functions. Inverse Laplace transform, convolution theorem, unit step function, delta function, evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method.

Partial Differential Equations: (08 hours)
Solutions of first order linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Applications of Partial Differential Equations: (10 hours)
Method of separation of variables, equation of vibrating string, solution of wave equation by D'Alembert's method, one dimensional heat flow, two dimensional heat flow.

Random variables and Probability Distributions: (10hrs)
Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Mean and variance of Binomial, Poisson and Normal distributions and applications.

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
2. A text book of Engineering Mathematics,N.P. Bali and Manish Goyal, Laxmi Publications, Reprint,2010.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Introduction to Probability Theory,P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003(Reprint).
3. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
4. Advanced Engineering Mathematics, H.K.Das, S.Chand & CompanyPvt.Ltd,2014.
5. Higher Engineering Mathematics, B.V,Ramana,Tata Mc Graw Hill Publishing company Ltd.,New Delhi,2008,6th edition.

Course Outcomes:
After successful completion of this course student will be able to

CO1.Develop different techniques of solving partial differential equations.

CO2.Implement theses techniques to evaluate the engineering problems.
CO3.develop techniques needed to calculate probabilities and describe the properties of discrete and continuous distribution functions.
CO4.do analysis of statistical data with the use of statistical tests in testing hypotheses.

SHU322A INTEGRAL CALCULUS ANDPROBABILITY

Teaching Scheme: 03Th+ 00Tut =00 Total **Total Credits: 03**
EvaluationScheme:30MSE+60ESE+10TA **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

5. To introduce the solution methodologies for second order Partial Differential Equations.
6. To study applications of partial differential equations in vibration of string and heat flow.
7. To equip students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
8. To introduce different sampling distributions and hypothesis tests.

Ordinary differential equations of higher orders:(07hours)
Linear differential equation with constant coefficient, complementary function, particular integral, complete solution; method of variation of parameters.
Integral Calculus :(07 hours)
Beta and Gamma functions and their properties; Evaluation of double integrals (Cartesian & polar),change of order of integration.

Laplace Transform: (08 hours)
Definition, Properties of Laplace Transform, Laplace transform of periodic functions. Inverse Laplace transform, convolution theorem, unit step function, delta function, solving ODEs by Laplace Transform method.

Partial Differential Equations: (08 hours)

Solutions of first order linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Random variables and Probability Distributions: (08 hrs)
Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Binomial, Poisson and Normal distributions and applications.

Textbooks:

3. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
4. A text book of Engineering Mathematics,N.P. Bali and Manish Goyal, Laxmi Publications, Reprint,2010.

References:

6. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
7. Introduction to Probability Theory,P. G. Hoel, S. C. Port and C. J. Stone, UniversalBook

Stall, 2003 (Reprint).
8. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
9. Advanced Engineering Mathematics, H.K.Das, S.Chand & CompanyPvt.Ltd,2014.
10. Higher Engineering Mathematics, B.V,Ramana,Tata Mc Graw Hill Publishing company Ltd.,New Delhi,2008,6th edition.

Course Outcomes:

After successful completion of this course student will be able to

CO1.Develop different techniques of solving partial differential equations.
CO2.Implement theses techniques to evaluate the engineering problems.
CO3.develop techniques needed to calculate probabilities and describe the properties of discrete and continuous distribution functions.
CO4.do analysis of statistical data with the use of statistical tests in testing hypotheses.

CEU321- FLUID MECHANICS

Teaching scheme: 03 L + 00 T Total 03 Credit:03
Evaluation Scheme: 30 MSE + 10 TA +60ESE Total Marks: 100
Duration of ESE: 2hrs. 30min.

Course objectives:

I. To introduce the basic concept of fluid, its properties and understand importance to Civil engineers

II. To study the principles of hydrostatics and methods to determine theforces.

III. To study the various equations related fluid motion andequilibrium

IV. To provide the knowledge of velocity and discharge measuring instruments inpipes

Introduction: Fluid & Fluid Mechanics, Applications in Civil Engineering, Physical properties of fluids-mass density, unit weight, specific gravity, compressibility, bulk modulus, surface tension, viscosity, Newton's law of viscosity, Dynamic and kinematic viscosity, classification of fluids

Fluid Statics: Measurement of pressure by manometers and gauges, Hydrostatic law, pressure at a point, Pascal's law, Pressure head, Atmospheric pressure, Absolute and gauge pressure, Total pressure and center of pressure, Pressure diagram, Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves.

Buoyancy and Floatation: Introduction, Buoyant force and center of buoyancy, Archimedes Principle, Principle of floatation, Metacenter and metacentric height, Equilibrium of floating bodies.

Fluid kinematics: Types of flow-steady & unsteady, uniform & non-uniform, laminar & turbulent, one, two & three dimensional, rotational & irrotational, compressible and incompressible, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluidflow

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation, assumption and limitations, different forms of energy heads, loss of head, Modified form of Bernoulli's theorem, Energy gradient line and Hydraulic gradient line, Impulse momentum equation.

Flow through pipes: Major losses and minor losses, Darcy Weisbach equation, Factor affecting friction factor, Coefficient of friction for commercial pipes, Moody's diagram, Flow through simple pipes, Flow through pipes in series, Flow through pipes in parallel, siphons pipes, Equivalent pipes, Water hammer in pipes-causes, effects & remedial measures, Transmission of power through pipe flow

Flow measurements: Velocity measurements: Pitot tube- basic principle of working, types, measurement of velocity by Pitot tube

Discharge measurement for pipes: Venturimeter-principle, equation for discharge, orifice plate meter **Discharge measurement for tanks:** Orifice-types, flow through circular sharp crested orifice, hydraulic coefficient, time required to empty a reservoir and tank

Laminar flow: Relation between shear stress and pressure gradient, Steady laminar flow through circular pipes, Hagen-Poiseuille law (no derivation), Laminar flow between parallel plates

Flow around immersed objects: Concept of boundary layer theory, Practical problems involving flow around immersed objects, Drag and lift-definition & expression, Types of drag, Pressure drag on flat plate, Stream line & bluff bodies.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi,2009

2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, 9th edition Standard Publishers Distributors, New Delhi,2009.

Reference Books:

1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi,2008

2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi,2011.

3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011

4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd,1997.

Course Outcomes:

After Completion of course students will be able to

CEU321.1	Solve the problems related to fluid statics, kinematics and dynamics
CEU321.2	Deal with various velocity and discharge measuring instruments in pipe
CEU321.3	Solve problems related to laminar (Viscous) fluid and fluid around immersed objects

CEU322 BUILDING MATERIALS AND CONSTRUCTION

Teaching scheme: 03 L + 00 T Total 03 **Credit:03**
Evaluation Scheme: 30 MSE + 10 TA +60ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30min.

Course Objectives:

I. To study various types of buildings according to National Building Code
II. To study various components of building, their functions
III. To introduce basic concepts of Building Construction.
IV. To study the properties and use of various building materials
V. To study the various methods of construction and temporary structures required for construction of various building components

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Introduction: Types of building as per National Building Code, Components of buildings and their functions, Types of structures-load bearing, framed and composite structures, their suitability, relative advantages and disadvantages

Foundation: Definition, purpose, Loads acting on foundation, Safe bearing capacity of soil- definition, Types of shallow foundation for buildings-spread footings for walls and columns, combined footing for columns, Raft foundation, Setting out for foundation

Floors & Floor finishes: Floors- Definition & purpose, Types of R.C.C. floors-R.C.C. slab floor, R.C.C. slab & beam floor, Ribbed floor, Flat Slab, their suitability and construction procedure, Flooring tiles: Types-plain cement tiles, Mosaic tiles, chequered tiles, ceramic tiles, glazed tiles, P.V.C. flooring tiles, Vitrified Tiles

Doors & Windows:

Wood based Products: Industrial timber products-veneer, Ply wood, particle board, fibre board, batten board, block board, pre-laminated boards, laminates.

Aluminium products: market forms, powder coating & anodizing of aluminium sections. Doors-Purpose, Criteria for location, Sizes, Types of door frames, Methods of fixing door frames, Types of door shutters- fully panelled, flush, louvered, glazed, sliding, revolving, rolling shutter, collapsible door, grilled door, suitability of different types of doors. Types of aluminium doors

Windows-Purpose, Criteria for location, Sizes, Types of wooden windows-casement, louvered, glazed, metal windows, Aluminium windows, Corner & bay windows, Ventilators-purpose and types, Grills for windows

Fixtures and fastenings of doors and windows: Hinges-types and uses, Bolts-types and uses, Handles and locks

Lintels: Lintels-purpose, types and their suitability, details of R.C.C.lintel

Stairs: Function, Technical terms, Criteria for location, Requirements of good stair, Types of stairs and their suitability, Design of stair, Lifts types and their suitability, Ramps, Escalators **Roofs:** Flat & pitched roofs-suitability, Types of steel roof trusses and their suitability, Placing and fixing trusses, Types of roofing sheets, Fixing of roofing sheets to trusses

Masonry construction:

Brick Masonry: Qualities of good bricks, Field and laboratory tests on bricks, Classification of bricks, Mortars: Types of mortars and their suitability, Proportion of mortars used for different works, Technical terms in brick masonry, Principles to be observed during construction, Header bond, Stretcher bond, English Bond, Flemish bond

(1 & 11/2 brick thick walls), Construction procedure, defects in brickmasonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction procedure

Concrete block masonry: Types-solid and hollow, common dimensions, Construction procedure

Plastering and pointing: Purpose, Types and their suitability, Procedure of plastering and pointing, Defects in plastering work

Colouring & painting:

Paints : Types, Procedure of painting old and new masonry surfaces, metal surfaces and wooden surfaces

Damp proofing: Causes and effects, Methods of damp proofing, materials required, Water proofing compounds- suitability and uses, Details of cavity wall construction

Termite Proofing: Definition, Methods of Termite Proofing

Joints in structure: Construction joints-necessity, provision of construction joint in slab, beam and columns, Expansion joints –necessity, location, materials used, details of expansion joints at foundation and roof level for a load bearing and framed structure.

Formwork & scaffolding: Form work-types and suitability, Period for removal offormwork, Scaffolding: Necessity, Types, Details of erections

Text Books:

1. Building Construction, Sushil Kumar, 19th edition, Standard Publishers Distributors, New Delhi,2008
2. Building Materials, P.C. Verghese, 1st edition, Prentice-Hall of India, NewDelhi, 2009.
3. Building Materials and Construction, Saurabh Kumar Soni, Reprint 2015, S. K. Kataria & Sons, Daryaganj, New Delhi -110002

Reference Books:

(1) National Building Code of India 2005, B.I.S., 2nd revision, Techniz Books International, New Delhi,2005.

(2) NFPA 5000: Building Construction & Safety Code, NFPA, Techniz Books International,
New Delhi, 2009

(3) Building Materials & Components for Developing Countries, C.B.R.I., TataMc-Graw Hill Publishing Co. New Delhi, 1990.

(4) Building Construction, Gurucharan Singh, 11 th Edition, Standard Book House, New Delhi 2010

Course Outcomes

CEU 322.1. Students will be able to identify various types of Buildings

CEU 322.2. Students will be able to classify basic components of building

CEU 322.3. Students will be able to understand the importance and role of each component of building

CEU 322.4. Students will be able to characterize and understand the use of various building materials

CEU 322.5. Students will be able to decide suitable construction techniques/methods for various construction works

CEU323 SOLID MECHANICS

Teaching scheme: 03 L + 00T **Total 03** **Credit:03**

Evaluation Scheme: 30 MSE + 10 TA +60ESE **Total Marks: 100**

Duration of ESE: 2hrs. 30min

Course Objectives:

I. To establish an understanding of fundamental concepts of stresses, strains and response of elastic solid to external loadings.

II. To provide the knowledge of principles, theorems required for analysis and design of various types of structural members subjected to axial , transverse shear, bending and torsional loadings.

III. To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.

IV. To built the necessary theoretical background for further structural analysis and design courses.

Course Contents:

Simple Stresses and Strains:

Concept of stress and strain, St. Venants principle, types of stresses and strains, Hooke's law, stress-strain diagram for mild steel and brittle material.

Working stress, factor of safety, lateral strain, poissons ratio and volumetric strain. Elastic constants and relationship among them.

Bars of varying section – composite bar of two materials only-temperature stresses.

Strain energy-Resilience-Gradual, sudden, Impact and shock loading and their applications.

Principal Stresses and Principal Planes:

General two dimensional stress system. Stress at a point on a plane, principal stresses and principal planes. Mohr's circle of stress, concept of ellipse of stress and its use. Principal strains and circle of strain.

Shear Force (S.F.) and Bending Moment (B.M.) Diagrams For Determinate Beams.

S.F. and B.M. diagrams for cantilever, simply simply supported beams with and without overhangs. Calculation of maximum B.M. and S.F. and location of point of contra flexure due to concentrated load, uniformly distributed loads and uniformly varying loads and moments. Relation among shear force, bending moment and loading intensity.

Stresses In Beams (Flexural and Shear):

(i) Flexural or bending stresses:

Theory of simple bending – Assumption- Derivation of bending equation M/I = F/Y = E/R

Section modulus of rectangular and circular section (Solid and Hollow). Moment of resistance. Bending stress in solid, hollow and built up sections. Design of simple beam section.

(ii) Shearing Stresses:

Derivation for shear stress in beam, shear stress distribution across various beam sections like rectangular, circular and built up sections.

Torsion:

(i) Derivation of equation and its assumptions. Polarmodulus

Application of equation to hollow and solid circular shaft, torsional, circular shaft subjected to combined bending and torsion.

(ii) Thin cylinders and Spheres

Derivation for circumferential stress and longitudinal stress. Calculation of circumferential and longitudinal stresses in a cylinder of thin sphere subjected to internal pressure.

Slope and Deflection Of Determinate Beam:

Relation between moment, slope and deflection, derivation of moment area theorems.

Slope and deflection of statically determinate beams subjected to concentrated loads and uniformly distributed load by Macaulay's Method and Moment area method.(Numerical Examples)

Concept of Conjugate Beam method (No numerical examples)

Combined Direct and Bending Stresses:

Combined direct and bending stresses, applications to short columns with eccentric loads.

Text Book:

1. Mechanics of Materials, Beer and Johnston, Tata McGraw Hill Publication
2. Mechanics of Structures- Vol-I, S.B. Junnarkar, Charotar publication house, 32[th]Edition 2016
3. Strength of Materials, R.Subramanian, Oxford University Press,2007

Reference Book:

1. Mechanics of Materials, Gere and Timoshenko, CBS Publishers
2. Engineering Mechanics of Solids, E.P. Popov, 2nd Edition, Prentice HallIndia,1998
3. Strength of Materials, G.H. Ryder, Prentice Hall Publications, 3rd Edition,2002.

Course Outcomes:

On completion of course students will be able:

CEU323.1 Understand basic concepts of stress-strain, and evaluate behavior and other physical properties of elastic isotropic materials.

CEU323.2 Determine the internal forces in structural elements under different types of loadings (axial, transverse shear, bending, and torsional) and draw their graphical representation.

CEU323.3 Apply the concept of principal stresses and strains for analysis of structural element.

CEU323.4 Calculate the deflection at any point on a determinant beam subjected to combination of loads.

CEU-324 ENGINEERING GEOLOGY

Teaching scheme: 03 L + 00 TTotal 03 Credit:03
Evaluation Scheme: 30 MSE + 10 TA +60ESE Total Marks: 100 Duration of ESE: 2hrs. 30min.

Course Objectives:

I. To introduce basics of Geology and study different types natural materials like rocks & minerals.

II. To understand the various natural dynamic processes their influence on the surfacial features, natural material and their consequences.

III. To know the importance of knowledge of Geology helpful for major Civil Engineering projects.

Introduction - Objective of Study; Scope of subject; Branches of Geology. General Geology- Surface relief of the earth; External and Internal Agents; Weathering, Erosion, Denudation & Decomposition; Earth Movements; Metamorphism; and Volcanism. Petrology-Rock & minerals, Rock forming, Primary and secondary minerals; Essential & Accessory minerals. Igneous Petrology-Mineral composition, felsic and mafic minerals, Textures, Textural variation. Secondary Rocks & Sedimentary Deposits- Rock weathering Agents; Transportation and consolidation Products of weathering and classification; Study of Common Rock types. Metamorphic Rocks-Agents of metamorphism; Types of metamorphism, Textures; Study of common Rock types.

Structural Geology-Study and classification of structures; Concept of Rock Deformation & Tectonics. Dip and Strike. Types of folds, faults, Inlier, Outliers; Joints and fractures; Mode of occurrences in various rocks. Importance of structural elements in Engineering operations. Physical Geology; Geological Action of Rivers; River Rejuvenation and resulting features.

Earthquakes and Mountain Building; Earth Movements and Interior of Earth; Seismic zones and occurrence of earthquakes; Types of earthquakes. Mountain building process. Groundwater-Types of Watertable, depth zone & relation between surface relief and watertable; Influence of texture and structure on Ground water; G.W. movement and storage; Geological work of groundwater & effects. Indian Geology-General principles of Stratigraphy and age of earth ; Divisions of Geological time and Time scale.
Physiographic division of India and their characteristics; History of Peninsula, Significance and Structural characters; Economic minerals and importance.

Building Stones-Requirements of good building stones; Strength, durability, Dressing, Availability; Suitability of common rocks as building stones. Landslides Causes, Role of water, stability of slopes; Prevention of landslides, precautions to be taken while construction of various structures. Case histories Engineering Significance of PGE on Geological Structures
; Detailed case histories.

Preliminary Geological Investigations; Use of geological maps and sections; Verification of surface data and subsurface explorations; Drill holes, test pits, trenches, exploratory drills Interpretation of drilling data & compilation of data; Correlation of surface data with results of subsurface exploration; Limitations of Drilling. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Classification of Rock material strength. Core logging .Rock Quality Designation. Rock mass description.

Tunneling-Influence of Geological conditions on design and construction of Tunnels
;Importance of Geology in Alignment of Tunnel; Difficulties in tunneling related to

lithology, etc Role of groundwater in tunneling ;Troublesome geological conditions; Suitability of common rock types for tunneling; Lined and unlined tunnels; Case histories. Geology of Dam Sites ;Physical and Geological characters; Strength, stability and water tightness ;Preliminary Geological work on dam sites; Conditions for locating dam, Precautions to be taken; Treatment of leaky rocks, faults, dykes, crush zones, etc; Earthquakes in regions of dams; Case histories; Geology of Reservoirs and Bridge Sites; Physical Properties & suitable Geological conditions for Reservoir sites; Importance of Groundwater studies and case-histories; Importance of bridge foundations; PGE for exploration of piers and abutments of bridges; Influence of nature and structures of rock on bridge foundations, Case histories

Text Books:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2. Text Book of Engineering Geology, N. Chenna Kesavulu, 2ndEdition

(2009), Macmillan PublishersIndia.

3. A Text Book of Engineering Geology , Dr R B Gupte, Publication :PUNE

VIDYARTHI GRIHA PRAKASHAN (2009 EDITION).ISBN:8185825033.

4. A text book of Geology, Mukharjee, P.K., The World Press Pvt. Ltd.

Reference Books

1. R.Legget : Geology and Engineering – McGraw Hill Book Co., London

2 .FGH Blyth, and M.H. De Freitas, : Geology for Engineers, ELBS. 1974London

Course Outcomes:

After Completion of course students will able to:

CEU324.1 Know the fundamental concepts leading to formation of the Earth ; Rocks and Minerals.

CEU324.2 Develop the ability to perform basic engineering geological assessments and analysis.

CEU324. 3 Understand the relevance of Engineering Geology in complex projects which will strengthen their practical understanding of the subject.

CEU325 BUILDING MATERIALS AND CONSTRUCTION LAB

Teaching scheme: 02 PTotal02 **Credit: 01**

Evaluation Scheme: 25 ICA +25ESE **Total Marks:50**

Prerequisites:

Basic knowledge about various building components, building materials

Course Objectives:

I. To draw the free hand sketches of various components of abuilding

II. To prepare the detailed drawings of various building components

III. To set out in field, the layout of a building

It is a representative list of practical/exercises. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU322) from the list or otherwise.

List of Practical:

1 Drawing free-hand sketches in the Sketch book of following building components

1. Different types of foundations
2. Different types of R.C.C.Floors
3. Line diagrams of different types of steel roof trusses
4. Different types of stairs (plan and elevations)
5. Types of bonds in brick masonry –plan and elevation of stretcher & header bond, one brick thick wall in English and Flemish bond, brick columns
6. Expansion joints at foundation and roof level in load bearing and framed structure
7. Any one type of scaffolding (elevation and section)
8. Form work for R.C.C.floor
9. Section of typical load bearing and framed structure

2. Drawing of following building components on half imperial drawing sheet

i. Details of fully panelled/flush door and glazed window, indicating dimensions

ii. Design of dog-legged stair from given data and its drawing (plan and section)

iii. Details of steel roof truss along with roof covering and fixing at support

iv. Preparation of setting-out plan for foundation from given line plan of a two-room building

3. Setting out in field for foundation of building from the plan in sheet no.2(iv)

4. Setting out in field layout of compound wall for plot having curved corner

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed exercise wise using continuous assessment in formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in viva-voce

Course Outcomes:

325.1. Students will be able to explain various buildings components bydrawing the free hand sketches

325.2Students will be able to prepare the detailed drawings of various building components

325.3 Students will be able to set out in field, the layout of abuilding

CEU-326 ENGINEERING GEOLOGY LAB

Teaching scheme:02 P **Total Credit: 01**

Evaluation Scheme: 25 ICA +25ESE **Total Marks:50**

Prerequisites:

Basic knowledge about various rocks and minerals.

Course Educational Objectives:

I. To understand and identify the various minerals and rocks occurring in nature.

II. To understand and Construct geological sections from contoured geological maps

III. To set out in field, for understanding knowledge of complex geology as needed for Civil Engg projects.

It is a representative list of practicals/exercises. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU324) from the list or otherwise.

List of Experiments

1. Identification of the following minerals in hand specimens:

   Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, Iceland spar, gypsum, satin spar, fluorite, barites, tourmaline, beryl, graphite, asbestos, talc, kyanite, garnet, galena, magnetite, haematite, limonite, iron pyrites, chromite, bauxite, azurite, malachite, psilomelane.

2. Identification of the following rock types in hand specimens:

   Igneous Rocks

   Granites, syenites, diorites, gabbros, rhyolites, trachytes, andesites, basalts, varieties of Deccan trap rocks, volcanic breccias, pegmatites, dolerites, graphic granites.

   Sedimentary Rocks

   Laterites, bauxites, conglomerates, breccias, sandstones, quartzites, grits, arkose, shales, mudstone. Chemical and organic limestones.

Metamorphic Rocks

Marbles, quartzites, varities of gneisses, slates, phyllites and varieties of schists.

3. Construction of geological sections from contoured geological maps, interpreting geological features without drawing section, solution of engineering geological problems such as alignment of dams, tunnels, roads, canals, bridges, etc. based on geological maps.

4. A field visit to site of Geological work is mandatory for gaining field knowledge of the subject and a report to be submitted as a part thereof..

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed exercise wise using continuous assessment in formats A &B.

ESE – The End Semester Exam for Practical shall be based on actual Practicals performed in Laboratory and viva-voce.

Course Outcomes:

After Completion of course students will able to:

326.1 The students will get the basic knowledge about natural material like rocks and minerals and their usage as well as their availability.

326.2 The students will know the significance of geological investigations for civil engineering projects and site selection as well as for the preparation of feasibility reports and others

326.3 The knowledge of subject will also help them to understand the geological maps and language for the discussion on geological reports to resolve civil engineering problems.

CEU 327 SOLID MECHANICS LAB

Teaching scheme:02 P Total 02 Credit: 01
Evaluation Scheme: 25 ICA +25ESE Total Marks:50

Course Objectives:

I. To study the mechanical properties of materials when subjected to different types of loading.

II. To verify the principals studied in solid mechanics theory by performing experiments in laboratory.

It is a representative list of practicals. The instructor may choose experiment as per his/her requirements (so as to cover entire contents of the course CEU323) from the list or otherwise. Minimum eight experiments should be performed.

List of Experiments:

1) Tension test on mild steel or TOR steel.

2) Hardness tests (Brinell and Rockwell) on mild steel, copper, aluminum, brass and castiron.

3) Impact test on mild steel, aluminum, copper, brass, cast iron.

4) Shear test on mild steel and aluminum.

5) Torsion test on mild steel and cast iron.

6) Fatigue test on mild steel.

7) Measurement of deflection in statically determinate beam.

8) Flexure test on wooden beam.

9) Determination of stiffness and modulus of rigidity of spring.

10) Compression test on wood (parallel and perpendicular to grains).

11) Strain measurement using Rosette- strain gauge.

13) Compression test on metals.

Course Outcomes:

On completion of course students will be able to:

CEU327.1 Performs, tension, shear, torsion and compression tests on solid materials.

CEU327.2 Determine the toughness of the material using Charpy and Izodtest.

CEU327.3 Determine the Brinell and Rockwell hardness number of given metal specimen.

CEU327.4 Estimate the elastic constants through compression test on spring and deflection test on beams.

Note-

ICA- The internal continuous assessment shall be based on practical record and knowledge/ Skills acquired. The performances shall be assessed experiment wise using continuous assessment formats

ESE- The End Semester Exam for practical shall be viva-voce.

IV – Sem B. Tech Civil
CEU421 HYDRAULIC ENGINEERING

Teaching scheme:03L **Total:03** **Credit:03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs.30min

Course objectives:

1. To study various equations for flow through prismatic channel and its applications to flow problems
2. To introduce the concepts of model study and its application to flow problems
3. To study the working principles of fluid machinery
4. To introduce the concepts of Gradually varied flow and Rapidly varied flow.

Uniform Flow through channel: Types of channels, Geometrical properties of prismatic channel section, types of flow through channel, Characteristics of uniform flow through prismatic channel, Chezys equation, Mannings equation, Mannings constant for different types of channel surfaces, Economical channel section, Conditions for rectangular & trapezoidal economical channel section, Specific energy of flow, Specific force and specific discharge, specific energy diagram, critical depth, criteria for critical depth, subcritical, critical and supercritical flow, Froude No.

Velocity measurements: Current meter-types and working, Floats-types
Discharge measurement for channels: Notches-Types, Discharge over rectangular notch, triangular notch, trapezoidal notch, Cippolletti notch, End contraction and velocity of approach, Francis formula, Weirs- discharge over broad crested weir, ventilation of weir Flumes- Venturiflume –working principle and computation of discharge, River gauging by segment method

Non-uniform flow through channel: Types of non-uniform flow, Gradually varied flow (GVF) and rapidly varied flow (RVF), Equation of GVF and its alternative solutions, Classification of channel bed slopes, Various GVF profiles, their characteristics and field examples, Rapidly varied flow, Hydraulic jump- definition, location, practical examples of its occurrence, Analysis of hydraulic jump in rectangular channel-relation between conjugate depths, energy dissipation, Classification of jumps, Practical applications of hydraulic jump, Energy dissipation below ogee spillway

Model investigations: Buckingham's–phi theorem, Model study-similitude, Types of similarities, Types of forces acting on structures, Force ratios, Non-dimensional numbers and their significance, Reynolds Model law & Frouds Model Law and their applications for model studies of hydraulic structures, Distorted and undistorted models, Scale effect.

Impact of jet - Impact of jet on plane and curved surfaces (stationary and moving), when jet striking normally at center of plate.

Pumps: Definition and types and suitability
Centrifugal pump: Components and their functions, principle, working, priming, power required, Multistage pumps, pumps in series, specific speed

Reciprocating pumps: Components and their functions, principle, working, power required, Air vessel and its function

Modern Pumps: Deep submersible pumps- Components and working, Jet pumps, turbine pumps

Hydraulic turbines: Elements of hydroelectric power generation power plant, Hydraulic turbines-definition, Heads and efficiencies, Classification based on various criteria, Choice of turbine,Specific speed and its significance, Pelton wheel turbine and Francis turbine – suitability, components and their functions.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi,2009
2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, Standard Publishers Distributors, New Delhi, 9th edition2009.

Reference Books:

1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi,2008
2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.
3. Fluid Mechanics &its Applications, Vijay Gupta &SantoshK.Gupta,2ndedition,NewAge International Publishers, New Delhi, 2011
4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd,1997.

Course Outcomes:

After Completion of course students will be able to

CEU421.1	Apply various equations for flow through prismatic channel
CEU421.2	Apply to the various model laws to the flow problems
CEU421.3	Solve the problems of gradually varied flow and Rapidly varied low.
CEU421.4	Acquired knowledge of working principles of fluid machinery

CEU422- SURVEYING

Teaching scheme:03L **Total:03** **Credit:03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs.30min

Course Objectives:

I. To introduce basic concepts of surveying.
II. To study the methods of linear and angular measurements.
III. To use various equipment for surveying, levelling, contouring.
IV. To apply the knowledge of surveying and levelling onfield.

Introduction: Surveying- Necessity & purpose, Classification of survey, principles of surveying, Basic measurements in surveying.

Linear Measurements: Instruments for measurement of linear measurements, Chaining a line, Chaining on sloping ground, Offsets-Types, Instruments for marking offsets, Direct and indirect ranging, obstacles in chaining &ranging, errors in measurements, corrections to field measurements, Cross staff survey.

Angular Measurements: Prismatic compass, Bearings, local attraction and correction to bearings, calculation of included angles from bearing.

Chain & Compass surveying: Reconnaissance, Selection of survey stations, Survey lines, Chain& compass traversing- Open & closed traverse, Booking field notes, Plotting of traverse, errors, graphical method of adjustment.

Plane table surveying: Objective and equipment required for plane table survey, Methods of plane table - Radiation, Intersection, Traversing and Resection, Orientation of plane table, methods of orientation, Advantages, disadvantages, limitations and errors of plane table surveying.

Levelling: Bench mark & its types, Auto level, Digital level, Temporary adjustments, levelling staffs and its types, precautions in levelling, booking of field readings in field book, calculation of RL, Arithmetic checks, Reciprocal levelling, Profile levelling, difficulties, Errors and mistakes in levelling, correction for curvature & refraction.

Contouring: Definition, characteristics, contour interval, methods of locating contours, interpolation of contours, contour maps & it's uses, contour drawing.

Planimeter: Digital planimeter-components, setting, selection of scale, computation of area.

Theodolite: Component parts of Transit Theodolite, fundamental lines, temporary adjustment, measurement of horizontal angles, measurement of vertical angles, deflection angles, magnetic bearing, lining in by Theodolite, balancing in by Theodolite, prolonging a straight line, laying off horizontal angle, Theodolite traversing, Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gale's traverse table.

Tacheometry: Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points. Use of tacheometry in surveying.

Use of Advance Instruments in Surveys: Study and use of various electronics equipment's like EDM and Total Station.

TEXT BOOKS:-

1. Surveying part-I by T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi GrihaPrakashan,Pune, 24th Edition,2002

2. Surveying Vol. I andVol .II, B. C. Punmia, Laxmi Publication (P) New Delhi,17th edition,2008

REFERENCE BOOKS:-

1. Surveying Vol. I by S.K. Duggal, Tata McGraw Hill Publishing Company Ltd., NewDelhi
2. Surveying Vol. I by Santosh kumar Garg, Khanna Publishers, NewDelhi

Course Outcomes:-

After Completion of course students will able to

CEU422.1 Identify and use suitable equipment for linear and angular measurements.
CEU422.2 Taking accurate measurements, recording the field information, plotting and adjustment of traverse.
CEU422.3 Use different types of surveying and levelling equipment.
CEU422.4 Apply the knowledge of surveying and levelling on field.

CEU423 TRANSPORTATION ENGINEERING

Teaching scheme:03L **Total03** **Credit:03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs.30min

CourseObjectives:

I. To introduce basic concepts of Highways, bridges
II. To study the properties and use of various highway materials
III. To study the geometric design, construction procedure of various pavements and maintenance of highways
IV. To study various components of bridges and their functions and hydraulic design of bridge

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Introduction

Importance of Transportation in National Development, Different modes of transportation and their relative advantages & disadvantages. Characteristics of Road Transport History of Development of Roads in India, road development plans.

Highway planning & engineering surveys: Necessity, Planning Surveys, Preparation of Plans, Master plan and its phasing, Highway alignment, Engineering surveys, Drawings and reports, Stages in new Highway Project.

Highway geometric design & IRC recommendations: Design controls and criteria, Highway cross sectional elements, Camber, Width of pavement or carriageway, Width of roadway or Formation width, Right of way, Sight distance and its types, Super elevation and its design, Widening of pavement on curves, Gradient, Vertical curves, Method of Introduction of Super elevation and Extra widening in Field. Typical cross section of Highway in cutting and filling

Highway materials and testing: Stone aggregates properties and different tests, Bituminous Materials – Bitumen, Tests on bitumen, cutback bitumen, Bituminous emulsions, Tar, Bituminous paving mixes, Design of bituminous mixes – Marshall method

Design of highway pavement: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Flexible pavement using IRC 37:2001, IRC 37:2012, Fatigue and Rutting failure criteria, Burmisters method for design of two layers and three layers pavements. Wheel load stress, temperature stress in rigid pavements, Design of Rigid pavement, joints in rigid pavement

Construction of Bituminous pavements - specifications and gradation of materials in different layers, construction procedure of WBM Type base course, WMM type base course, construction procedure of Dense Bituminous Macadam, Bituminous Macadam, and Bituminous Concrete type wearing course, construction procedure for Surface Dressing, Penetration Macadam,

Construction of Cement Concrete pavements - construction of pavement slab, alternate Bay method, continuous construction method. Construction of joints.

Highway maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works, Maintenance of W.B.M. roads, Bituminous surfaces and cement concrete pavements, Strengthening of existing pavements using Benkelman Beam study.

Highway drainage: Importance, Surface drainage, Sub-surface drainage

Bridge Engineering: Bridge Components and their functions, Abutments, piers and wing walls, bearing, approaches, foundation, Types and choice, Site selection.

Culverts & causeways- Types and selection

Types of major bridges based on various criteria, Suitability of different types.

Design flood discharge, Linear waterway, Scour depth, Afflux, Depth of foundation, Free board, Economic span, IRC recommendations, Data collection

Text Books:

1. Highway Engineering, Khanna S.K. & Justo C.E.G., Nem Chand & Bros., Roorkee, 11th edition, 2001
2. Elements of Bridges, Tunnels and Railways Engineering, Bindra, S. P., Dhanpat Rai & Sons, Delhi,2010
3. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, PrenticeHall of India, 2009

Reference Books:

1) Transportation Engineering Vol. I & II, V.N. Vazirani &S.P. Chandola, 7th edition ,Khanna Publishers, New Delhi, 2003.
2) Transportation Engineering: An Introduction, Khisty and Lall, 3rd edition, Prentice Hall,2003.
3) Bridge Engineering, Ponnuswamy, S., 2nd edition, Tata McGraw Hill Publication, New Delhi, 2007.
4) Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 1st Edition, John Willey, 2008.
5) Principles of Highway Engineering &Traffic Analysis, Mannering F.L., Walter P.K. and Scott John, 3rd edition Willey,2004.

Course Outcomes:

After Completion of course students will able to

CEU423.1 understand basic concepts of Highways, bridges

CEU423.2 understand the properties of various Highway materials and their suitability under different conditions

CEU423.3 understand the concept of geometric design of road and use the data for road design

CEU 423.4 design the Highway pavement

CEU423.5 understand the functions of various components of bridge and carry out hydraulic design ofbridge.

CEU424 CONCRETETECHNOLOGY

Teaching Scheme:03L **Total=03** **Credits :03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 Hrs. 30Min

Course Objectives:

I. To study the ingredients of concrete , their properties and understand their influence on the quality of concrete.

II. To learn the fundamental procedure of concrete making and understand the various factors those will affect the quality of fresh as well as hardened concrete.

III. To study the methods of concrete mix proportioning.

IV. To provide the students with knowledge of special purposes concrete and concreting techniques for extreme environmental conditions.

Course Content

Ingredients of Concrete:

(i) Cement : Manufacture of Portland cement, chemical composition, hydration of cement, Tests on cement ,Types of cement – Rapid hardening, Low heat, sulphate resisting, hydrophobic, oil-well, colored and white cements.

(ii) Aggregates: Classification of aggregates, mechanical and physical properties, Bulking, grading of aggregates, tests on aggregates, Artificial and recycled aggregates.

Fresh Concrete: (i) Methods of mixing, modes of transporting, placing, compacting and curing of concrete.

(ii) Admixtures: functions, classification, chemical admixtures – plasticizers, super plasticizers, retarders, air entraining agents, Mineral admixtures – fly ash, silica fumes, GGBS, rice husk ash.

Hardened Concrete: (i) Strength of concrete- factors affecting strength, stress-strain relation, tensile and compressive strength.

(ii) Time dependent behavior of concrete- creep and shrinkage,

Significance of permeability and durability, factors reducing durability- chemical attack, temperature, frost action

(iii) Non-destructive testing of concrete: Rebound Hammer test, Ultra sonic pulse velocity test, concrete core test

Concrete Mix Design: factors to be considered, method of mix design IS (10262) and IRC- 44 method, acceptance criteria for concrete as per IS specification.

Cracks in Concrete and Quality Control of Concrete:

(i) Cracks: types of cracks in concrete, causes of cracks, evaluation of cracks, common types of repairs.

(ii)Quality Control: Factors causing variation in the quality of concrete, Quality assurance measures required in concreting, advantages of quality control.

Special Concretes and Concreting in extreme environmental conditions:

Special concretes: Fiber reinforced concrete, polymer concrete, shotcrete, self compacting concrete, vacuum dewatered concrete.

hot weather concreting, cold weather concreting and underwater concreting.

Text Books:

1. Concrete Technology, M.L.Gambhir, 5th Edition, Tata McGraw-Hill Publication.
2. Concrete Technology, M.S.Shetty, S. Chand Publication

Reference Books:

1. Properties of Concrete Technology, A.R.Santhakumar, Oxford University Press, NewDelhi,2007.
2. Properties of Concrete, A.M.Neville, Pearson Education India.

Course Outcomes:

After completion of course students will be able to:

CEU424.1 Identify and enlist the properties of ingredients and admixtures required to make good concrete.

CEU424.2 Apply measures to get quality concrete in fresh as well as hardened state and use non-destructive testing procedure for evaluation of concrete properties.

CEU424.3 Design a Concrete Mix as per IS requirements.

CEU424.4 Illustrate the salient features of special purpose concrete and concreting techniques for extreme environmental conditions.

CEU425 HYDROLOGY AND WATER RESOURCESENGINEERING

Teaching Scheme:03L **Total=03** **Credits :03**
Evaluation Scheme: 30 MSE + 10 TA +60 ESE **Total Marks: 100**
Duration of ESE: 2 Hrs. 30Min

Course objectives:

I. To Introduce the basic concept of hydrological processes and various hydrological parameters
II. To Impart the knowledge of irrigation engineering to determine crop water requirement
III. To Study the types of dams and Utilize the knowledge in checking the stability of dam
IV. To Study the types of spillway and its energy dissipation arrangement

Introduction to Hydrology :Hydrological cycle, Precipitation-forms and types, : Infiltration, Evaporation, Transpiration, Eapotranspiration, Runoff: Sources and components of runoff, Hydrograph: Flood hydrographs and its components, Computation of floods.

Introduction to Irrigation: Irrigation Necessity, benefits and disadvantages of irrigation

Estimating Irrigation Demand: Cropping seasons & base period, Consumptive use of water , Principal Indian crops and their cropping seasons, Duty and Delta, Factors affecting Duty and Delta, Consumptive use of water, Gross command area, Irrigable command area, Culturable command area, Intensity of Irrigation, Determining the crop water requirement.

Irrigation Schemes: Classification of Irrigation Projects, Irrigation Project Structure, Planning of Water Storage Reservoir: Selection of site, various investigations, Area-capacity curve, Reservoir storage zones, Planning of reservoir, Effect of sedimentation, Life of reservoir, Fixing capacity of reservoir, Fixing of Dead Storage & live storage, Fixing of flood and surcharge storage, Fixing Control levels.

Types of Dams: Brief introduction of various types of dam, Gravity Dams: Typical layouts of gravity dam, Typical non-overflow section of concrete gravity dams, different components, Galleries-Types and their functions, The expected loadings for gravity dams –different forces acting, Earthquake and its effect on dams, Elementary and Practical profile of gravity dam,

Earthen dams: Introduction to Types and elements of earth dam, causes of failure, seepage and drainage arrangement. Typical cross section of zoned section –components and their functions,

Spillway: Introduction to types of spillway, energy dissipation below spillway including its type. types of crest gates

Canals: Brief introduction of Layout of canal system, Types of canals, Canal alignment, Typical cross sections.

Text Books:

1. Irrigation Water Resources and Water Power Engineering, Dr. P.N. Modi, Standard Book House, New Delhi,2009.
2. Irrigation Engineering and Hydraulic Structures, R. K. Sharma, Oxford and IBH Publishing Company, New Delhi,1994.

Reference Books:

1. Elementary Engineering Hydrology, M. J. Deodhar, Pearson Education2009
2. Concrete Dams, R. S. Vershney, Oxford and IBH Publishing Co., New Delhi, 1982.
3. Theory and Design of Irrigation Structures, R.S. Varshney, S. C. Gupta and R.L. Gupta, Nemchand & Brothers, Roorkee, 1992.

Course Outcomes:

After Completion of course students will able to

CEU425.1 Gain broad understanding of hydrology and knowledge of different hydrographs

CEU425.2 Understand various types of dam and its components

CEU425.3 Understand various types of spillway and its components

CEU 426 HYDRAULIC ENGINEERING LAB

Teaching scheme:02P Total02
Evaluation Scheme: 25 ICA +25ESE

Credit: 01
Total Marks:50

Course objectives:

I. To study the hydraulic jump, and concept of impact of jet

II. To know the working of Venturimeter / Orifice plate meter

III. To learn the working principles of fluid machinery

It is a representative list of practical's. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU421) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Determination of Chezy's / Manning's constant of uniform flow through prismatic channel
2. Calibration of rectangular/triangular notch
3. Determination of conjugate depths, length of jump, loss of head of hydraulic jump in laboratory tilting flume
4. Calibration of laboratory Venturi flume
5. Determination of hydraulic gradient of non-uniform flow in prismatic channel
6. Determination of force due to Impact of jet on plates and vanes
7. Determination of efficiency of reciprocating pumps
8. Determination of efficiency of Centrifugal pumps
9. Study experiment on specific energy diagram

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge /skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A &B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

Course Outcomes:

After Completion of course students will be able to

CEU426.1	Calibrate of rectangular/triangular notch and Venturiflume
CEU426.2	Calculate the forces due to impact of jet
CEU426.3	Determine the Chezy's / Manning's constant of uniform flow through prismatic channel
CEU426.4	Determine of efficiency pumps

CEU427- SURVEYING LAB

Teaching scheme:02P   Total-02   **Credit:02**
Evaluation Scheme:ICA-50,ESE-25   **Total Marks:75**

Course Objectives:-

I. Use of survey instruments
II. Take linear and angular measurements
III. Prepare layouts and plans
IV. Set out alignments for roads, railways etc

LIST OF PRACTICAL:-

The list given below is just a guideline. All surveying equipments should be introduced and used before conducting experiments.

1) Cross staff survey for measurement of area of field, calculation of area and measurement of area by digital planimeter.
2) Chain & compass traversing for survey of a given area, booking notes in field book and plotting of features on ground on A1 size sheet.
3) Plane table surveying for survey of a given area and plotting of features on ground on A1 size sheet.
4) Profile levelling for minimum 500 m length and Plotting of L-section & cross section of road on A1 size sheet.
5) Block contouring for minimum 200x200 m area and Plotting of contour map on A1 size sheet.
6) Measuring horizontal angles, vertical angles, deflection angles, magnetic bearing, prolonging straight lines, lying off horizontal angles by Theodolite.
6) Computation of horizontal distances and elevations by tachometry for horizontal and inclined sites.
7) Measurement of distances, angles, magnetic bearings for a traverse by Total Station.

LAB WORK

Lab work shall consist of field book, and drawing sheets based on above mentioned Practical's.

PRACTICAL EXAMINATION

Practical examination shall consist of practical performance for a given problem in field and viva voce based on term work.

Course Outcomes:-

After completion of course the students will be able to:-

427.1 Understand the importance and scope of surveying in any engineering project.

427.2 Apply the principles of surveying and use conventional and advanced surveying instruments for surveying.

427.3 Execute a Survey Project.

CEU 428 TRANSPORTATION ENGINEERINGLAB

Teaching scheme:02P **Total 01** **Credit: 01**

Evaluation Scheme: 25 ICA +25ESE **Total Marks:50**

Course Educational Objectives:

I. To introduce basic concepts of highway material testing

II. To decide the suitability of Coarse Aggregates and Bitumen for Road construction by conducting the various tests and comparing with standards

III. To determine CBR value and using it in the design of flexible pavement

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU423) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. To determine the suitability of Aggregate for Road construction by conducting the various tests such as

A) Crushing strength test,
B) Los Angeles abrasion test / Deval abrasion test,
C) Aggregate impact test,
D) Aggregate Shape test - Flakiness index and elongation index determination.
E) Determination of specific Gravity of Coarse Aggregates

2. To determine the suitability of Bitumen for Road construction by conducting thevarious tests such as

A) Determination of Bitumen Content by Centrifuge Extractor
B) Penetration test,
C) Ductility test,
D) Viscosity test,
E) Softening point test,
F) Flash and fire point test.
G) Marshall Stability Value

3. Determination of CBR value and design of flexible pavement

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in Viva-voce

Course Outcomes Expected:

CEU 428.1 Students will be able to understand basic concepts of highway material testing

CEU 428.2 Students will be able to decide the suitability of Coarse Aggregates and Bitumen for Road construction

CEU 428.3 They will be able to determine CBR value and using it in the design of flexible pavement

CEU429 MATERIAL TESTING AND EVALUATIONLAB

Teaching Scheme:02P **Total=02** **Credits:01**
Evaluation scheme: 25 ICA+25ESE **Total Marks:50**

Course Objectives:

I. To test the physical properties of ingredients of concrete like cement, fine and coarse aggregates.

II. To understand the concept and procedure of different tests conducted onfresh and hardened concrete.

III. To gain knowledge of proportioning a concrete mix for given specificationof ingredients.

It is a representative list of experiments. The instructor may choose experiment as per his/her requirements (so as to cover entire contents of the course CEU424) from the list or otherwise. Minimum eight practicals should be performed. From the group of experiments given below, tests of groups 1, 3,6and8 are compulsory while other tests are chosen from remaining groups as required.

Group of Experiments:

1. Tests on cement -I : Fineness, standard consistency and setting time (initial and final)
2. Tests on cement -II : Soundness and compressive strength
3. Testsonfreshconcrete–I:Workabilitytestsi.e.slumptest,compactionfactortest, flow table test
4. Tests on fresh concrete–II: Effect of admixture on workability and setting time of concrete (plasticizer, super plasticizer, retarder)
5. Tests on aggregates –I:Bulkdensityandvoidratiooffineandcoarseaggregates, aggregate crushing value
6. Tests on hardened concrete I : Compressive strength, flexural strength, split tensile strength, modulus of elasticity and modulus of rupture of concrete
7. Tests on hardened concrete II: Non-destructive tests i.e. Rebound Hammer Test, Ultra sonic pulse velocity test
8. Concrete mix design as per IS specifications.
9. Tests on bricks: Compressive strength, water absorption and efflorescence test.

Course Outcomes:

After completion of course students will be able to:

CEU429.1 Assess the different physical properties of cement, fine and coarse aggregates at field and in lab to decide their suitability for making concrete.

CEU429.2 Determine the properties of fresh and hardened concrete to assess quality of concrete.

CEU429.3 Design concrete mix as per IS specifications.

Note-

ICA- The internal continuous assessment shall be based on practical record and knowledge/ Skills acquired. The performances shall be assessed experiment wise using continuous assessment formats.

ESE- The End Semester Exam for practical shall be viva-voce.

GOVT. COLLEGE OF ENGINEERING AMRAVATI

DEPARTMENT OF CIVIL ENGINEERING

PROPOSED CURRICULUM

For

B. TECH. (Civil Engineering)

2020- 2021

B. Tech. (Civil Engineering)

SEM III													
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**						**Credits**
							Theory			**Practical**		**Total**	
			Theory Hrs /week	**Tutorial Hrs/week**	**Practical Hrs/week**	**Total**	**MSE**	**TA**	**ESE**	**ICA**	**ESE**		
Basic Science Course	SHU321A SHU 322A	Differential Equations and Probability *Integral Calculus and Probability	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU321	Fluid Mechanics	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU322	Building Materials and Construction	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU323	Solid Mechanics	3	-	-	3	30	10	60	-	-	100	3
Mandatory courses (non credit)	SHU322	Constitution of India	1	-	-	1	-	-	60	-	-	60	0
Professional Core courses	CEU324	Engineering Geology	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU325	Building Materials and Construction Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU326	Engineering Geology Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU327	Solid Mechanics Lab	-	-	2	2	-	-	-	25	25	50	1
	Total		**16**	**00**	**06**	**22**	**150**	**50**	**360**	**75**	**75**	**710**	**18**

**For Direct Second Year Admitted Students*

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

B. Tech. (Civil Engineering)

SEM IV

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
Professional Core courses	CEU421	Hydraulic Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU422	Surveying	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU423	Transportation Engineering	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU424	Concrete Technology	3	-	-	3	30	10	60	-	-	100	3
Professional Core courses	CEU425	Hydrology & Water Resources Engineering	3	-	-	3	30	10	60	-	-	100	3
Mandatory courses (non credit)	SHU422	Environmental Science	1	-	-	1	-	-	60	-	-	60	0
Professional Core courses	CEU426	Hydraulic Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU427	Surveying Lab	-	-	4	4	-	-	-	50	25	75	2
Professional Core courses	CEU428	Transportation Engineering Lab	-	-	2	2	-	-	-	25	25	50	1
Professional Core courses	CEU429	Materials, Testing & Evaluation Lab	-	-	2	2	-	-	-	25	25	50	1
	Total		**16**	**00**	**10**	**26**	**150**	**50**	**360**	**125**	**100**	**785**	**20**

TA: Teacher's Assessment MSE: Mid Semester Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

ESE Duration for Theory: 2.30 Hrs

SHU321A DIFFERENTIAL EQUATIONS AND PROBABILITY

Teaching Scheme: 03Th+ 00Tut = 00 Total **Total Credits: 03**
Evaluation Scheme: 30MSE+60ESE+10TA **Total Marks: 100**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

1. To introduce the solution methodologies for second order Partial Differential Equations.
2. To study applications of partial differential equations in vibration of string and heat flow.
3. To equip students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
4. *To introduce different sampling distributions and hypothesis tests.*

Laplace Transform: (10 hours)
Definition**,** Properties of Laplace Transform, Laplace transform of periodic functions. Inverse Laplace transform, convolution theorem, unit step function, delta function, evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method.

Partial Differential Equations: (08 hours)
Solutions of first order linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Applications of Partial Differential Equations: (10 hours)
Method of separation of variables, equation of vibrating string, solution of wave equation by D'Alembert's method, one dimensional heat flow, two dimensional heat flow.

Random variables and Probability Distributions: (10 hrs)
Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Mean and variance of Binomial, Poisson and Normal distributions and applications.

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
2. A text book of Engineering Mathematics,N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Introduction to Probability Theory,P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003 (Reprint).
3. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
4. Advanced Engineering Mathematics, H.K.Das, S.Chand & Company Pvt.Ltd,2014.
5. Higher Engineering Mathematics, B.V,Ramana,Tata Mc Graw Hill Publishing company Ltd.,New Delhi,2008,6th edition.

Course Outcomes:
After successful completion of this course student will be able to

CO1.Develop different techniques of solving partial differential equations.
CO2.Implement theses techniques to evaluate the engineering problems.
CO3.develop techniques needed to calculate probabilities and describe the properties of discrete and continuous distribution functions.
CO4.do analysis of statistical data with the use of statistical tests in testing hypotheses.

SHU322A INTEGRAL CALCULUS AND PROBABILITY

Teaching Scheme: 03Th+ 00Tut = 00 Total **Total Credits: 03**
Evaluation Scheme: 30MSE+60ESE+10TA **Total Marks: 100**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

5. To introduce the solution methodologies for second order Partial Differential Equations.
6. To study applications of partial differential equations in vibration of string and heat flow.
7. To equip students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
8. To introduce different sampling distributions and hypothesis tests.

Ordinary differential equations of higher orders:(07hours)
Linear differential equation with constant coefficient, complementary function, particular integral, complete solution; method of variation of parameters.
Integral Calculus :(07 hours)
Beta and Gamma functions and their properties; Evaluation of double integrals (Cartesian & polar),change of order of integration.

Laplace Transform: (08 hours)
Definition**,** Properties of Laplace Transform, Laplace transform of periodic functions. Inverse Laplace transform, convolution theorem, unit step function, delta function, solving ODEs by Laplace Transform method.

Partial Differential Equations: (08 hours)

Solutions of first order linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Random variables and Probability Distributions: (08 hrs)
Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Binomial, Poisson and Normal distributions and applications.

Textbooks:

3. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
4. A text book of Engineering Mathematics,N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010.

References:

6. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.

7. Introduction to Probability Theory,P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003 (Reprint).
8. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
9. Advanced Engineering Mathematics, H.K.Das, S.Chand & Company Pvt.Ltd,2014.
10. Higher Engineering Mathematics, B.V,Ramana,Tata Mc Graw Hill Publishing company Ltd.,New Delhi,2008,6th edition.

Course Outcomes:

After successful completion of this course student will be able to

CO1.Develop different techniques of solving partial differential equations.
CO2.Implement theses techniques to evaluate the engineering problems.
CO3.develop techniques needed to calculate probabilities and describe the properties of discrete and continuous distribution functions.
CO4.do analysis of statistical data with the use of statistical tests in testing hypotheses.

CEU321- FLUID MECHANICS

Teaching scheme: 03 L + 00 T Total 03 **Credit: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs. 30 min.

Course objectives:

I. To introduce the basic concept of fluid, its properties and understand importance to Civil engineers

II. To study the principles of hydrostatics and methods to determine the forces.

III. To study the various equations related fluid motion and equilibrium

IV. To provide the knowledge of velocity and discharge measuring instruments in pipes

Introduction: Fluid & Fluid Mechanics, Applications in Civil Engineering, Physical properties of fluids-mass density, unit weight, specific gravity, compressibility, bulk modulus, surface tension, viscosity, Newton’s law of viscosity, Dynamic and kinematic viscosity, classification of fluids

Fluid Statics: Measurement of pressure by manometers and gauges, Hydrostatic law, pressure at a point, Pascal’s law, Pressure head, Atmospheric pressure, Absolute and gauge pressure, Total pressure and center of pressure, Pressure diagram, Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves.

Buoyancy and Floatation: Introduction, Buoyant force and center of buoyancy, Archimedes Principle, Principle of floatation, Metacenter and metacentric height, Equilibrium of floating bodies.

Fluid kinematics: Types of flow-steady & unsteady, uniform & non-uniform, laminar & turbulent, one, two & three dimensional, rotational & irrotational, compressible and incompressible, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluid flow

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation, assumption and limitations, different forms of energy heads, loss of head, Modified form of Bernoulli's theorem, Energy gradient line and Hydraulic gradient line, Impulse momentum equation.

Flow through pipes: Major losses and minor losses, Darcy Weisbach equation, Factor affecting friction factor, Coefficient of friction for commercial pipes, Moody's diagram, Flow through simple pipes, Flow through pipes in series, Flow through pipes in parallel, siphons pipes, Equivalent pipes, Water hammer in pipes-causes, effects & remedial measures, Transmission of power through pipe flow

Flow measurements: Velocity measurements: Pitot tube- basic principle of working, types, measurement of velocity by Pitot tube

Discharge measurement for pipes: Venturimeter-principle, equation for discharge, orifice plate meter **Discharge measurement for tanks:** Orifice-types, flow through circular sharp crested orifice, hydraulic coefficient,time required to empty a reservoir and tank

Laminar flow: Relation between shear stress and pressure gradient, Steady laminar flow through circular pipes, Hagen-Poiseuille law (no derivation), Laminar flow between parallel plates

Flow around immersed objects: Concept of boundary layer theory,Practical problems involving flow around immersed objects, Drag and lift-definition & expression, Types of drag, Pressure drag on flat plate, Stream line & bluff bodies.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009

2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, 9th edition Standard Publishers Distributors, New Delhi, 2009.

Reference Books:

1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008

2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.

3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011

4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd, 1997.

Course Outcomes:

After Completion of course students will be able to

CEU321.1 Solve the problems related to fluid statics, kinematics and dynamics

CEU321.2 Deal with various velocity and discharge measuring instruments in pipe

CEU321.3 Solve problems related to laminar (Viscous) fluid and fluid around immersed objects

CEU322 BUILDING MATERIALS AND CONSTRUCTION

Teaching scheme: 03 L + 00 T Total 03 **Credit: 03**

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To study various types of buildings according to National Building Code

II. To study various components of building, their functions

III. To introduce basic concepts of Building Construction.

IV. To study the properties and use of various building materials

V. To study the various methods of construction and temporary structures required for construction of various building components

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Introduction: Types of building as per National Building Code, Components of buildings and their functions, Types of structures-load bearing, framed and composite structures, their suitability, relative advantages and disadvantages

Foundation: Definition, purpose, Loads acting on foundation, Safe bearing capacity of soil-definition, Types of shallow foundation for buildings-spread footings for walls and columns, combined footing for columns, Raft foundation, Setting out for foundation

Floors & Floor finishes: Floors- Definition & purpose, Types of R.C.C. floors-R.C.C. slab floor, R.C.C. slab & beam floor, Ribbed floor, Flat Slab, their suitability and construction procedure, Flooring tiles: Types-plain cement tiles, Mosaic tiles, chequered tiles, ceramic tiles, glazed tiles, P.V.C. flooring tiles, Vitrified Tiles

Doors & Windows:

Wood based Products**:** Industrial timber products-veneer, Ply wood, particle board, fibre board, batten board, block board, pre-laminated boards, laminates.

Aluminium products: market forms, powder coating & anodizing of aluminium sections. Doors-Purpose, Criteria for location, Sizes, Types of door frames, Methods of fixing door frames, Types of door shutters- fully panelled, flush, louvered, glazed, sliding, revolving, rolling shutter, collapsible door, grilled door, suitability of different types of doors. Types of aluminium doors

Windows-Purpose, Criteria for location, Sizes, Types of wooden windows-casement, louvered, glazed, metal windows, Aluminium windows, Corner & bay windows, Ventilators-purpose and types, Grills for windows

Fixtures and fastenings of doors and windows**:** Hinges-types and uses, Bolts-types and uses, Handles and locks

Lintels: Lintels-purpose, types and their suitability, details of R.C.C.lintel

Stairs: Function, Technical terms, Criteria for location, Requirements of good stair,Types of stairs and their suitability, Design of stair, Lifts types and their suitability, Ramps, Escalators **Roofs:** Flat & pitched roofs-suitability, Types of steel roof trusses and theirsuitability, Placing and fixing trusses, Types of roofing sheets, Fixing of roofing sheets to trusses

Masonry construction:

Brick Masonry: Qualities of good bricks, Field and laboratory tests on bricks,Classification of bricks, Mortars**:** Types of mortars and their suitability, Proportion of mortars used for different works, Technical terms in brick masonry, Principles to be observed during construction, Header bond, Stretcher bond, English Bond, Flemish bond (1 & 11/2 brick thick walls), Construction procedure, defects in brick masonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction procedure

Concrete block masonry: Types-solid and hollow, common dimensions, Construction procedure

Plastering and pointing: Purpose, Types and their suitability, Procedure of plastering and pointing, Defects in plastering work

Colouring & painting:

Paints : Types, Procedure of painting old and new masonry surfaces, metal surfaces and wooden surfaces

Damp proofing: Causes and effects, Methods of damp proofing, materials required, Water proofing compounds**-** suitability and uses, Details of cavity wall construction

Termite Proofing: Definition, Methods of Termite Proofing

Joints in structure: Construction joints-necessity, provision of construction joint in slab, beam and columns, Expansion joints –necessity, location, materials used, details of expansion joints at foundation and roof level for a load bearing and framed structure.

Formwork & scaffolding: Form work-types and suitability, Period for removal offormwork, Scaffolding**:** Necessity, Types, Details of erections

Text Books:

1. Building Construction, Sushil Kumar, 19th edition, Standard Publishers Distributors, New Delhi, 2008
2. Building Materials, P.C. Verghese, 1st edition, Prentice-Hall of India, New Delhi, 2009.
3. Building Materials and Construction, Saurabh Kumar Soni,Reprint 2015, S. K. Kataria & Sons, Daryaganj, New Delhi - 110002

Reference Books:

(1) National Building Code of India 2005, B.I.S., 2nd revision, Techniz Books International, New Delhi, 2005.

(2) NFPA 5000: Building Construction & Safety Code, NFPA, Techniz Books International,
New Delhi, 2009

(3) Building Materials & Components for Developing Countries, C.B.R.I., Tata Mc-Graw Hill Publishing Co. New Delhi, 1990.

(4) Building Construction, Gurucharan Singh, 11th Edition, Standard Book House, New Delhi, 2010.

Course Outcomes

CEU 322.1. Students will be able to identify various types of

Buildings CEU 322.2. Students will be able to classify basic

components of building

CEU 322.3. Students will be able to understand the importance and role of each component of building

CEU 322.4. Students will be able to characterize and understand the use of various building materials

CEU 322.5. Students will be able to decide suitable construction techniques/methods for various construction works

CEU323 SOLID MECHANICS

Teaching scheme: 03 L + 00 T Total 03 Credit: 03

Evaluation Scheme: 30 MSE + 10 TA + 60 ESE Total Marks: 100

Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To establish an understanding of fundamental concepts of stresses, strains and response of elastic solid to external loadings.

II. To provide the knowledge of principles, theorems required for analysis and design of various types of structural members subjected to axial , transverse shear, bending and tortional loadings.

III. To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.

IV. To built the necessary theoretical background for further structural analysis and design courses.

Course Contents:

Simple Stresses and Strains:

Concept of stress and strain, St. Venants principle, types of stresses and strains, Hooke's law, stress-strain diagram for mild steel and brittle material.

Working stress, factor of safety, lateral strain, poissons ratio and volumetric strain. Elastic constants and relationship among them.

Bars of varying section – composite bar of two materials only-temperature stresses.

Strain energy-Resilience-Gradual, sudden, Impact and shock loading and their applications.

Principal Stresses and Principal Planes:

General two dimensional stress system. Stress at a point on a plane, principal stresses and principal planes. Mohr's circle of stress, concept of ellipse of stress and its use. Principal strains and circle of strain.

Shear Force (S.F.) and Bending Moment (B.M.) Diagrams For Determinate Beams.

S.F. and B.M. diagrams for cantilever, simply simply supported beams with and without overhangs. Calculation of maximum B.M. and S.F. and location of point of contra flexure due to concentrated load, uniformly distributed loads and uniformly varying loads and moments. Relation among shear force, bending moment and loading intensity.

Stresses In Beams (Flexural and Shear):

(i) Flexural or bending stresses:

Theory of simple bending – Assumption- Derivation of bending equation M/I = F/Y = E/R

Section modulus of rectangular and circular section (Solid and Hollow). Moment of resistance. Bending stress in solid, hollow and built up sections. Design of simple beam section.

(ii) Shearing Stresses:

Derivation for shear stress in beam, shear stress distribution across various beam sections like rectangular, circular and built up sections.

Torsion:

(i) Derivation of equation and its assumptions. Polar modulus

Application of equation to hollow and solid circular shaft, tortional, circular shaft subjected to combined bending and torsion.

(ii) Thin cylinders and Spheres

Derivation for circumferential stress and longitudinal stress. Calculation of circumferential and longitudinal stresses in a cylinder of thin sphere subjected to internal pressure.

Slope and Deflection Of Determinate Beam:

Relation between moment, slope and deflection, derivation of moment area theorems.

Slope and deflection of statically determinate beams subjected to concentrated loads and uniformly distributed load by Macaulay's Method and Moment area method.(Numerical Examples)

Concept of Conjugate Beam method (No numerical examples)

Combined Direct and Bending Stresses:

Combined direct and bending stresses, applications to short columns with eccentric loads.

Text Book:

1. Mechanics of Materials, Beer and Johnston, Tata McGraw Hill Publication
2. Mechanics of Structures- Vol-I, S.B. Junnarkar, Charotar publication house, 32th Edition

2016
3. Strength of Materials, R.Subramanian, Oxford University Press, 2007

Reference Book:

1. Mechanics of Materials, Gere and Timoshenko, CBS Publishers
2. Engineering Mechanics of Solids, E.P. Popov, 2nd Edition, Prentice Hall India,1998
3. Strength of Materials, G.H. Ryder, Prentice Hall Publications, 3rd Edition, 2002.

Course Outcomes:

On completion of course students will be able:

CEU323.1 Understand basic concepts of stress-strain, and evaluate behavior and other physical properties of elastic isotropic materials.

CEU323.2 Determine the internal forces in structural elements under different types of loadings (axial, transverse shear, bending, and tortional) and draw their graphical representation.

CEU323.3 Apply the concept of principal stresses and strains for analysis of structural element.

CEU323.4 Calculate the deflection at any point on a determinant beam subjected to combination of loads.

CEU-324 ENGINEERING GEOLOGY

Teaching scheme: 03 L + 00 T Total 03 **Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs. 30 min.

Course Objectives:

I. To introduce basics of Geology and study different types natural materials like rocks & minerals.

II. To understand the various natural dynamic processes their influence on the surfacial features, natural material and their consequences.

III. To know the importance of knowledge of Geology helpful for major Civil Engineering projects.

Introduction - Objective of Study; Scope of subject; Branches of Geology. General Geology- Surface relief of the earth; External and Internal Agents; Weathering, Erosion, Denudation & Decomposition; Earth Movements; Metamorphism; and Volcanism. Petrology-Rock & minerals, Rock forming, Primary and secondary minerals; Essential & Accessory minerals. Igneous Petrology-Mineral composition, felsic and mafic minerals, Textures, Textural variation. Secondary Rocks & Sedimentary Deposits- Rock weathering Agents; Transportation and consolidation Products of weathering and classification; Study of Common Rock types. Metamorphic Rocks-Agents of metamorphism; Types of metamorphism, Textures; Study of common Rock types.

Structural Geology-Study and classification of structures; Concept of Rock Deformation & Tectonics. Dip and Strike. Types of folds, faults, Inlier, Outliers; Joints and fractures; Mode of occurrences in various rocks. Importance of structural elements in Engineering operations. Physical Geology; Geological Action of Rivers; River Rejuvenation and resulting features.

Earthquakes and Mountain Building; Earth Movements and Interior of Earth; Seismic zones and occurrence of earthquakes; Types of earthquakes. Mountain building process. Groundwater-Types of Watertable, depth zone & relation between surface relief and watertable; Influence of texture and structure on Ground water; G.W. movement and storage; Geological work of groundwater & effects. Indian Geology-General principles of Stratigraphy and age of earth ; Divisions of Geological time and Time scale.
Physiographic division of India and their characteristics; History of Peninsula, Significance and Structural characters; Economic minerals and importance.

Building Stones-Requirements of good building stones; Strength, durability, Dressing, Availability; Suitability of common rocks as building stones. Landslides Causes, Role of water, stability of slopes; Prevention of landslides, precautions to be taken while construction of various structures. Case histories Engineering Significance of PGE on Geological Structures
; Detailed case histories**.**

Preliminary Geological Investigations; Use of geological maps and sections; Verification of surface data and subsurface explorations; Drill holes, test pits, trenches, exploratory drills Interpretation of drilling data & compilation of data; Correlation of surface data with results of subsurface exploration; Limitations of Drilling. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Classification of Rock material strength. Core logging .Rock Quality Designation. Rock mass description.

Tunneling-Influence of Geological conditions on design and construction of Tunnels ;Importance of Geology in Alignment of Tunnel; Difficulties in tunneling related to lithology, etc Role of groundwater in tunneling ;Troublesome geological conditions; Suitability of common rock types for tunneling; Lined and unlined tunnels; Case histories.

Geology of Dam Sites ;Physical and Geological characters; Strength, stability and water tightness ;Preliminary Geological work on dam sites; Conditions for locating dam, Precautions to be taken; Treatment of leaky rocks, faults, dykes, crush zones, etc; Earthquakes in regions of dams; Case histories; Geology of Reservoirs and Bridge Sites; Physical Properties & suitable Geological conditions for Reservoir sites; Importance of Groundwater studies and case-histories; Importance of bridge foundations; PGE for exploration of piers and abutments of bridges;Influence of nature and structures of rock on bridge foundations, Case histories

Text Books:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2. Text Book of Engineering Geology, N. Chenna Kesavulu, 2ndEdition

(2009), Macmillan Publishers India.

3. A Text Book of Engineering Geology , Dr R B Gupte, Publication :PUNE

VIDYARTHI GRIHA PRAKASHAN (2009 EDITION). ISBN:8185825033.

4. A text book of Geology, Mukharjee, P.K., The World Press Pvt. Ltd.

Reference Books

1. R.Legget : Geology and Engineering – McGraw Hill Book Co., London

2 .FGH Blyth, and M.H. De Freitas, : Geology for Engineers, ELBS. 1974London

Course Outcomes:

After Completion of course students will able to:

CEU324.1 Know the fundamental concepts leading to formation of the Earth ; Rocks and Minerals.

CEU324.2 Develop the ability to perform basic engineering geological assessments and analysis.

CEU324. 3 Understand the relevance of Engineering Geology in complex projects which will strengthen their practical understanding of the subject.

CEU325 BUILDING MATERIALS AND CONSTRUCTION LAB

Teaching scheme: 02 P Total 02 **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Prerequisites:

Basic knowledge about various building components, building materials

Course Objectives:

I. To draw the free hand sketches of various components of a building
II. To prepare the detailed drawings of various building components
III. To set out in field, the layout of a building

It is a representative list of practical/exercises. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU322) from the list or otherwise.

List of Practical:

1 Drawing free-hand sketches in the Sketch book of following building components

1. Different types of foundations
2. Different types of R.C.C. Floors
3. Line diagrams of different types of steel roof trusses
4. Different types of stairs (plan and elevations)
5. Types of bonds in brick masonry –plan and elevation of stretcher & header bond, one brick thick wall in English and Flemish bond, brick columns
6. Expansion joints at foundation and roof level in load bearing and framed structure
7. Any one type of scaffolding (elevation and section)
8. Form work for R.C.C. floor
9. Section of typical load bearing and framed structure

2. Drawing of following building components on half imperial drawing sheet

i. Details of fully panelled/flush door and glazed window, indicating dimensions
ii. Design of dog-legged stair from given data and its drawing (plan and section)
iii. Details of steel roof truss along with roof covering and fixing at support
iv. Preparation of setting-out plan for foundation from given line plan of a two-room building

3. Setting out in field for foundation of building from the plan in sheet no. 2(iv)

4. Setting out in field layout of compound wall for plot having curved corner

Note:

ICA - The Internal Continuous Assessment shall be based on practical record andknowledge / skill acquired. The performance shall be assessed exercise wise using continuous assessment in formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in viva-voce

Course Outcomes:

325.1. Students will be able to explain various buildings components by drawing

the free hand sketches
Students will be able to prepare the detailed drawings of various building components

325.2. Students will be able to set out in field, the layout of a building

CEU-326 ENGINEERING GEOLOGY LAB

Teaching scheme: 02 P **Total Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Prerequisites:

Basic knowledge about various rocks and minerals.

Course Educational Objectives:

I. To understand and identify the various minerals and rocks occurring in nature.
II. To understand and Construct geological sections from contoured geological maps
III. To set out in field, for understanding knowledge of complex geology as needed for Civil Engg projects.

It is a representative list of practicals/exercises. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU324) from the list or otherwise.

L ist of Experiments

1. Identification of the following minerals in hand specimens:

   Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, icelandspar, gypsum, satinspar, fluorite, barites, tourmaline, beryl, graphite, asbestos, talc, kyanite, garnet, galena, magnetite, haematite, limonite, iron pyrites, chromite, bauxite, azurite, malachite, psilomelane.

2. Identification of the following rock types in hand specimens:

   Igneous Rocks

   Granites, syenites, diorites, gabbros, rhyolites, trachytes, andesites, basalts, varieties of Deccan trap rocks, volcanic breccias, pegmatites, dolerites, graphic granites.

   Sedimentary Rocks

   Laterites, bauxites, conglomerates, breccias, sandstones, quartzites, grits, arkose, shales, mudstone. Chemical and organic limestones.

Metamorphic Rocks

Marbles, quartzites, varities of gneisses, slates, phyllites and varieties of schists.

3. Construction of geological sections from contoured geological maps, interpreting geological features without drawing section, solution of engineering geological problems such as alignment of dams, tunnels, roads, canals, bridges, etc. based on geological maps.

4. A field visit to site of Geological work is mandatory for gaining field knowledge of the subject and a report to be submitted as a part thereof..

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed exercise wise using continuous assessment in formats A & B.
ESE – The End Semester Exam for Practical shall be based on actual Practicals performed in Laboratory and viva-voce.

Course Outcomes:

After Completion of course students will able to:

326.1 The students will get the basic knowledge about natural material like rocks and minerals and their usage as well as their availability.

326.2 The students will know the significance of geological investigations for civil engineering projects and site selection as well as for the preparation of feasibility reports and others

326.3 The knowledge of subject will also help them to understand the geological maps and language for the discussion on geological reports to resolve civil engineering problems.

CEU 327 SOLID MECHANICS LAB

Teaching scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 50

Course Objectives:

I. To study the mechanical properties of materials when subjected to different types of loading.

II. To verify the principals studied in solid mechanics theory by performing experiments in laboratory.

It is a representative list of practicals. The instructor may choose experiment as per his/her requirements (so as to cover entire contents of the course CEU323) from the list or otherwise. Minimum eight experiments should be performed.

List of Experiments:

1) Tension test on mild steel or TOR steel.

2) Hardness tests (Brinell and Rockwell) on mild steel, copper, aluminum, brass and cast iron.

3) Impact test on mild steel, aluminum, copper, brass, cast iron.

4) Shear test on mild steel and aluminum.

5) Torsion test on mild steel and cast iron.

6) Fatigue test on mild steel.

7) Measurement of deflection in statically determinate beam.

8) Flexure test on wooden beam.

9) Determination of stiffness and modulus of rigidity of spring.

10) Compression test on wood (parallel and perpendicular to grains).

11) Strain measurement using Rosette- strain gauge.

13) Compression test on metals.

Course Outcomes:

On completion of course students will be able to:

CEU327.1 Performs, tension, shear, torsion and compression tests on solid materials.

CEU327.2 Determine the toughness of the material using Charpy and Izod test.

CEU327.3 Determine the Brinell and Rockwell hardness number of given metal specimen.

CEU327.4 Estimate the elastic constants through compression test on spring and deflection test on beams.

Note-

ICA- The internal continuous assessment shall be based on practical record and knowledge/ Skills acquired. The performances shall be assessed experiment wise using continuous assessment formats

ESE- The End Semester Exam for practical shall be viva-voce.

CEU421 HYDRAULIC ENGINEERING

Teaching scheme: 03 L **Total: 03** **Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs.30 min

Course objectives:

1. To study various equations for flow through prismatic channel and its applications to flow problems
2. To introduce the concepts of model study and its application to flow problems
3. To study the working principles of fluid machinery
4. To introduce the concepts of Gradually varied flow and Rapidly varied flow.

Uniform Flow through channel: Types of channels, Geometrical properties of prismatic channel section, types of flow through channel, Characteristics of uniform flow through prismatic channel, Chezys equation, Mannings equation, Mannings constant for different types of channel surfaces, Economical channel section, Conditions for rectangular & trapezoidal economical channel section, Specific energy of flow, Specific force and specific discharge, specific energy diagram, critical depth, criteria for critical depth, subcritical, critical and supercritical flow, Froude No.

Velocity measurements: Current meter-types and working, Floats-types
Discharge measurement for channels: Notches-Types, Discharge over rectangular notch, triangular notch, trapezoidal notch, Cippolletti notch, End contraction and velocity of approach, Francis formula, Weirs- discharge over broad crested weir, ventilation of weir Flumes- Venturiflume –working principle and computation of discharge, River gauging by segment method

Non-uniform flow through channel: Types of non-uniform flow, Gradually varied flow (GVF) and rapidly varied flow (RVF), Equation of GVF and its alternative solutions, Classification of channel bed slopes, Various GVF profiles, their characteristics and field examples, Rapidly varied flow, Hydraulic jump- definition, location, practical examples of its occurrence, Analysis of hydraulic jump in rectangular channel-relation between conjugate depths, energy dissipation, Classification of jumps, Practical applications of hydraulic jump, Energy dissipation below ogee spillway

Model investigations: Buckingham's–phi theorem,Model study-similitude, Types of similarities, Types of forces acting on structures, Force ratios, Non-dimensional numbers and their significance, Reynolds Model law & Frouds Model Law and their applications for model studies of hydraulic structures, Distorted and undistorted models, Scale effect.

Impact of jet - Impact of jet on plane and curved surfaces (stationary and moving), when jet striking normally at center of plate.

Pumps: Definition and types and suitability
Centrifugal pump: Components and their functions, principle, working, priming, power required, Multistage pumps, pumps in series, specific speed

Reciprocating pumps: Components and their functions, principle, working, power required, Air vessel and its function

Modern Pumps: Deep submersible pumps- Components and working, Jet pumps, turbine pumps

Hydraulic turbines: Elements of hydroelectric power generation power plant, Hydraulic turbines- definition, Heads and efficiencies, Classification based on various criteria, Choice of turbine, Specific speed and its significance, Pelton wheel turbine and Francis turbine – suitability, components and their functions.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009
2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, Standard Publishers Distributors, New Delhi, 9th edition 2009.

Reference Books:

1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008

2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.
3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011
4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd, 1997.

Course Outcomes:

After Completion of course students will be able to

CEU421.1 Apply various equations for flow through prismatic channel
CEU421.2 Apply to the various model laws to the flow problems
CEU421.3 Solve the problems of gradually varied flow and Rapidly varied flow.
CEU421.4 Acquired knowledge of working principles of fluid machinery

CEU422- SURVEYING

Teaching scheme: 03 L **Total: 03** **Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs.30 min

Course Objectives:

I. To introduce basic concepts of surveying.
II. To study the methods of linear and angular measurements.
III. To use various equipment for surveying, levelling, contouring.
IV. To apply the knowledge of surveying and levelling on field.

Introduction: Surveying- Necessity & purpose, Classification of survey, principles of surveying, Basic measurements in surveying.

Linear Measurements: Instruments for measurement of linear measurements, Chaining a line, Chaining on sloping ground, Offsets-Types, Instruments for marking offsets, Direct and indirect ranging, obstacles in chaining &ranging, errors in measurements, corrections to field measurements, Cross staff survey.

Angular Measurements: Prismatic compass, Bearings, local attraction and correction to bearings, calculation of included angles from bearing.

Chain & Compass surveying: Reconnaissance, Selection of survey stations, Survey lines, Chain& compass traversing- Open & closed traverse, Booking field notes, Plotting of traverse, errors, graphical method of adjustment.

Plane table surveying: Objective and equipment required for plane table survey, Methods of plane table - Radiation, Intersection, Traversing and Resection, Orientation of plane table, methods of orientation, Advantages, disadvantages, limitations and errors of plane table surveying.

Levelling: Bench mark & its types, Auto level, Digital level, Temporary adjustments, levelling staffs and its types, precautions in levelling, booking of field readings in field book, calculation of RL, Arithmetic checks, Reciprocal levelling, Profile levelling, difficulties, Errors and mistakes in levelling, correction for curvature & refraction.

Contouring: Definition, characteristics, contour interval, methods of locating contours, interpolation of contours, contour maps & it's uses, contour drawing.

Planimeter: Digital planimeter-components, setting, selection of scale, computation of area.
Theodolite: Component parts of Transit Theodolite, fundamental lines, temporary adjustment, measurement of horizontal angles, measurement of vertical angles, deflection angles, magnetic bearing, lining in by Theodolite, balancing in by Theodolite, prolonging a straight line, laying off horizontal angle, Theodolite traversing, Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gale's traverse table.

Tacheometry: Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points. Use of tacheometry in surveying.

Use of Advance Instruments in Surveys: Study and use of various electronics equipment's like EDM and Total Station.

TEXT BOOKS:-

1. Surveying part-I by T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi GrihaPrakashan, Pune, 24th Edition, 2002

2. Surveying Vol. I and Vol .II, B. C. Punmia, Laxmi Publication (P) New Delhi,17th edition,2008

REFERENCE BOOKS:-

1. Surveying Vol. I by S.K. Duggal, Tata McGraw Hill Publishing Company Ltd., New Delhi
2. Surveying Vol. I by Santosh kumar Garg, Khanna Publishers, New Delhi

Course Outcomes:-

After Completion of course students will able to

CEU422.1 Identify and use suitable equipment for linear and angular measurements.
CEU422.2 Taking accurate measurements, recording the field information, plotting and adjustment of traverse.
CEU422.3 Use different types of surveying and levelling equipment.
CEU422.4 Apply the knowledge of surveying and levelling on field.

CEU423 TRANSPORTATION ENGINEERING

Teaching scheme: 03 L **Total 03** **Credit: 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs.30 min

Course Objectives:

I. To introduce basic concepts of Highways, bridges
II. To study the properties and use of various highway materials
III. To study the geometric design, construction procedure of various pavements and maintenance of highways
IV. To study various components of bridges and their functions and hydraulic design of bridge

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Introduction

Importance of Transportation in National Development, Different modes of transportation and their relative advantages & disadvantages. Characteristics of Road Transport History of Development of Roads in India, road development plans.

Highway planning & engineering surveys: Necessity, Planning Surveys, Preparation of Plans, Master plan and its phasing, Highway alignment, Engineering surveys, Drawings and reports, Stages in new Highway Project.

Highway geometric design & IRC recommendations: Design controls and criteria, Highway cross sectional elements, Camber**,** Width of pavement or carriageway, Width of roadway or Formation width, Right of way, Sight distance and its types, Super elevation and its design, Widening of pavement on curves, Gradient, Vertical curves, Method of Introduction of Super elevation and Extra widening in Field. Typical cross section of Highway in cutting and filling

Highway materials and testing: Stone aggregates properties and different tests, Bituminous Materials **–** Bitumen, Tests on bitumen, cutback bitumen, Bituminous emulsions, Tar, Bituminous paving mixes, Design of bituminous mixes – Marshall method

Design of highway pavement: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Flexible pavement using IRC 37:2001, IRC 37:2012, Fatigue and Rutting failure criteria, Burmisters method for design of two layers and three layers pavements. Wheel load stress, temperature stress in rigid pavements, Design of Rigid pavement, joints in rigid pavement

Construction of Bituminous pavements - specifications and gradation of materials in different layers, construction procedure of WBM Type base course, WMM type base course, construction procedure of Dense Bituminous Macadam, Bituminous Macadam, and Bituminous Concrete type wearing course, construction procedure for Surface Dressing, Penetration Macadam,

Construction of Cement Concrete pavements - construction of pavement slab, alternate Bay method, continuous construction method. Construction of joints.

Highway maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works, Maintenance of W.B.M. roads, Bituminous surfaces and cement concrete pavements, Strengthening of existing pavements using Benkelman Beam study.

Highway drainage: Importance, Surface drainage, Sub-surface drainage

Bridge Engineering: Bridge Components and their functions, Abutments, piers and wing walls, bearing, approaches, foundation, Types and choice, Site selection.

Culverts & causeways- Types and selection

Types of major bridges based on various criteria, Suitability of different types.

Design flood discharge, Linear waterway, Scour depth, Afflux, Depth of foundation, Free board, Economic span, IRC recommendations, Data collection

Text Books:

1. Highway Engineering, Khanna S.K. & Justo C.E.G., Nem Chand & Bros., Roorkee, 11th edition, 2001
2. Elements of Bridges, Tunnels and Railways Engineering, Bindra, S. P., Dhanpat Rai & Sons, Delhi, 2010
3. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, Prentice Hall of India, 2009

Reference Books:

1) Transportation Engineering Vol. I & II, V.N. Vazirani & S.P. Chandola, 7th edition , Khanna Publishers, New Delhi, 2003.
2) Transportation Engineering: An Introduction, Khisty and Lall, 3rd edition, Prentice Hall, 2003.
3) Bridge Engineering, Ponnuswamy, S., 2nd edition, Tata McGraw Hill Publication, New Delhi, 2007.
4) Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 1st Edition, John Willey, 2008.
5) Principles of Highway Engineering & Traffic Analysis, Mannering F. L., Walter P. K. and Scott John, 3rd edition Willey, 2004.

Course Outcomes:

After Completion of course students will able to

CEU423.1 understand basic concepts of Highways, bridges

CEU423.2 understand the properties of various Highway materials and their suitability under different conditions

CEU423.3 understand the concept of geometric design of road and use the data for road design

CEU 423.4 design the Highway pavement

CEU423.5 understand the functions of various components of bridge and carry out hydraulic design of bridge.

CEU424 CONCRETE TECHNOLOGY

Teaching Scheme: 03 L **Total =03** **Credits : 03**
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 Hrs. 30 Min

Course Objectives:

I. To study the ingredients of concrete , their properties and understand their influence on the quality of concrete.
II. To learn the fundamental procedure of concrete making and understand the various factors those will affect the quality of fresh as well as hardened concrete.
III. To study the methods of concrete mix proportioning.
IV. To provide the students with knowledge of special purposes concrete and concreting techniques for extreme environmental conditions.

Course Content

Ingredients of Concrete:

(i) Cement : Manufacture of Portland cement, chemical composition, hydration of cement, Tests on cement ,Types of cement – Rapid hardening, Low heat, sulphate resisting, hydrophobic, oil-well, colored and white cements.

(ii) Aggregates: Classification of aggregates, mechanical and physical properties, Bulking, grading of aggregates, tests on aggregates, Artificial and recycled aggregates.

Fresh Concrete: (i) Methods of mixing, modes of transporting, placing, compacting and curing of concrete.

(ii) Admixtures: functions, classification, chemical admixtures – plasticizers, super plasticizers, retarders, air entraining agents, Mineral admixtures – fly ash, silica fumes, GGBS, rice husk ash.

Hardened Concrete: (i) Strength of concrete- factors affecting strength, stress-strain relation, tensile and compressive strength.

(ii) Time dependent behavior of concrete- creep and shrinkage,

Significance of permeability and durability, factors reducing durability- chemical attack, temperature, frost action

(iii) Non-destructive testing of concrete: Rebound Hammer test, Ultra sonic pulse velocity test, concrete core test

Concrete Mix Design: factors to be considered, method of mix design IS (10262) and IRC- 44 method, acceptance criteria for concrete as per IS specification.

Cracks in Concrete and Quality Control of Concrete:

(i) Cracks: types of cracks in concrete, causes of cracks, evaluation of cracks, common types of repairs.
(ii) Quality Control: Factors causing variation in the quality of concrete, Quality assurance measures required in concreting, advantages of quality control.

Special Concretes and Concreting in extreme environmental conditions:

Special concretes: Fiber reinforced concrete, polymer concrete, shotcrete, self compacting concrete, vacuum dewatered concrete.

hot weather concreting, cold weather concreting and underwater concreting.

Text Books:

1. Concrete Technology, M.L.Gambhir, 5th Edition, Tata McGraw-Hill Publication.
2. Concrete Technology, M.S.Shetty, S. Chand Publication

Reference Books:

1. Properties of Concrete Technology, A.R.Santhakumar, Oxford University Press, New Delhi,2007.
2. Properties of Concrete, A.M.Neville, Pearson Education India.

Course Outcomes:

After completion of course students will be able to:

CEU424.1 Identify and enlist the properties of ingredients and admixtures required to make good concrete.

CEU424.2 Apply measures to get quality concrete in fresh as well as hardened state and use non-destructive testing procedure for evaluation of concrete properties.

CEU424.3 Design a Concrete Mix as per IS requirements.

CEU424.4 Illustrate the salient features of special purpose concrete and concreting techniques for extreme environmental conditions.

CEU425 HYDROLOGY AND WATER RESOURCES ENGINEERING

Teaching Scheme: 03 L Total =03 Credits : 03
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2 Hrs. 30 Min

Course objectives:

I. To Introduce the basic concept of hydrological processes and various hydrological parameters
II. To Impart the knowledge of irrigation engineering to determine crop water requirement
III. To Study the types of dams and Utilize the knowledge in checking the stability of dam
IV. To Study the types of spillway and its energy dissipation arrangement

Introduction to Hydrology :Hydrological cycle, Precipitation-forms and types, : Infiltration, Evaporation, Transpiration, Eapotranspiration, Runoff: Sources and components of runoff, Hydrograph: Flood hydrographs and its components, Computation of floods.
Introduction to Irrigation: Irrigation Necessity, benefits and disadvantages of irrigation
Estimating Irrigation Demand: Cropping seasons & base period, Consumptive use of water , Principal Indian crops and their cropping seasons, Duty and Delta, Factors affecting Duty and Delta, Consumptive use of water, Gross command area, Irrigable command area, Culturable command area, Intensity of Irrigation, Determining the crop water requirement.
Irrigation Schemes: Classification of Irrigation Projects, Irrigation Project Structure, Planning of Water Storage Reservoir: Selection of site, various investigations, Area-capacity curve, Reservoir storage zones, Planning of reservoir, Effect of sedimentation, Life of reservoir, Fixing capacity of reservoir, Fixing of Dead Storage & live storage, Fixing of flood and surcharge storage, Fixing Control levels.
Types of Dams: Brief introduction of various types of dam, Gravity Dams: Typical layouts of gravity dam, Typical non-overflow section of concrete gravity dams, different components, Galleries-Types and their functions, The expected loadings for gravity dams –different forces acting, Earthquake and its effect on dams, Elementary and Practical profile of gravity dam,
Earthen dams: Introduction to Types and elements of earth dam, causes of failure, seepage and drainage arrangement. Typical cross section of zoned section –components and their functions,

Spillway: Introduction to types of spillway, energy dissipation below spillway including its type.
types of crest gates

Canals: Brief introduction of Layout of canal system, Types of canals, Canal alignment, Typical cross sections.

Text Books:

1. Irrigation Water Resources and Water Power Engineering, Dr. P.N. Modi, Standard Book House, New Delhi, 2009.
2. Irrigation Engineering and Hydraulic Structures, R. K. Sharma, Oxford and IBH Publishing Company, New Delhi, 1994.

Reference Books:

1. Elementary Engineering Hydrology, M. J. Deodhar, Pearson Education 2009
2. Concrete Dams, R. S. Vershney, Oxford and IBH Publishing Co., New Delhi, 1982.
3. Theory and Design of Irrigation Structures, R.S. Varshney, S. C. Gupta and R.L. Gupta, Nemchand & Brothers, Roorkee, 1992.

Course Outcomes:
After Completion of course students will able to
CEU425.1 Gain broad understanding of hydrology and knowledge of different hydrographs
CEU425.2 Understand various types of dam and its components
CEU425.3 Understand various types of spillway and its components

CEU 426 HYDRAULIC ENGINEERING LAB

Teaching scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 50

Course objectives:

I. To study the hydraulic jump, and concept of impact of jet

II. To know the working of Venturimeter / Orifice plate meter

III. To learn the working principles of fluid machinery

It is a representative list of practical's. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU421) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Determination of Chezy's / Manning's constant of uniform flow through prismatic channel
2. Calibration of rectangular/triangular notch
3. Determination of conjugate depths, length of jump, loss of head of hydraulic jump in laboratory tilting flume
4. Calibration of laboratory Venturiflume
5. Determination of hydraulic gradient of non-uniform flow in prismatic channel
6. Determination of force due to Impact of jet on plates and vanes
7. Determination of efficiency of reciprocating pumps
8. Determination of efficiency of Centrifugal pumps
9. Study experiment on specific energy diagram

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

Course Outcomes:
After Completion of course students will be able to
CEU426.1 Calibrate of rectangular/triangular notch and Venturiflume
CEU426.2 Calculate the forces due to impact of jet

CEU426.3 Determine the Chezy's / Manning's constant of uniform flow through prismatic channel

CEU426.4 Determine of efficiency pumps

CEU427- SURVEYING LAB

Teaching scheme: 02 P Total-02 Credit: 02
Evaluation Scheme: ICA-50, ESE-25 Total Marks: 75

Course Objectives:-

I. Use of survey instruments
II. Take linear and angular measurements
III. Prepare layouts and plans
IV. Set out alignments for roads, railways etc

LIST OF PRACTICAL:-

The list given below is just a guideline. All surveying equipments should be introduced and used before conducting experiments.

1) Cross staff survey for measurement of area of field, calculation of area and measurement of area by digital planimeter.
2) Chain & compass traversing for survey of a given area, booking notes in field book and plotting of features on ground on A1 size sheet.
3) Plane table surveying for survey of a given area and plotting of features on ground on A1 size sheet.
4) Profile levelling for minimum 500 m length and Plotting of L-section & cross section of road on A1 size sheet.
5) Block contouring for minimum 200x200 m area and Plotting of contour map on A1 size sheet.
6) Measuring horizontal angles, vertical angles, deflection angles, magnetic bearing, prolonging straight lines, lying off horizontal angles by Theodolite.
6) Computation of horizontal distances and elevations by tacheometry for horizontal and inclined sites.
7) Measurement of distances, angles, magnetic bearings for a traverse by Total Station.

LAB WORK

Lab work shall consist of field book, and drawing sheets based on above mentioned Practical's.

PRACTICAL EXAMINATION

Practical examination shall consist of practical performance for a given problem in field and viva voce based on term work.

Course Outcomes:-

After completion of course the students will be able to:-

427.1 Understand the importance and scope of surveying in any engineering project.

427.2 Apply the principles of surveying and use conventional and advanced surveying instruments for surveying.

427.3 Execute a Survey Project.

CEU 428 TRANSPORTATION ENGINEERING LAB

Teaching scheme: 02 P **Total 01** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Course Educational Objectives:

I. To introduce basic concepts of highway material testing

II. To decide the suitability of Coarse Aggregates and Bitumen for Road construction by conducting the various tests and comparing with standards

III. To determine CBR value and using it in the design of flexible pavement

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU423) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. To determine the suitability of Aggregate for Road construction by conducting the various tests such as

- A) Crushing strength test,
- B) Los Angeles abrasion test / Deval abrasion test,
- C) Aggregate impact test,
- D) Aggregate Shape test - Flakiness index and elongation index determination.
- E) Determination of specific Gravity of Coarse Aggregates

2. To determine the suitability of Bitumen for Road construction by conducting the various tests such as

- A) Determination of Bitumen Content by Centrifuge Extractor
- B) Penetration test,
- C) Ductility test,
- D) Viscosity test,
- E) Softening point test,
- F) Flash and fire point test.
- G) Marshall Stability Value

3. Determination of CBR value and design of flexible pavement

Note:

ICA - The Internal Continuous Assessment shall be based on practical record andknowledge /

skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in Viva-voce

Course Outcomes Expected:

CEU 428.1 Students will be able to understand basic concepts of highway material testing

CEU 428.2 Students will be able to decide the suitability of Coarse Aggregates and Bitumen for Road construction

CEU 428.3 They will be able to determine CBR value and using it in the design of flexible pavement

CEU429 MATERIAL TESTING AND EVALUATION LAB

Teaching Scheme: 02 P **Total =02** **Credits: 01**
Evaluation scheme: 25 ICA +25 ESE **Total Marks: 50**

Course Objectives:

I. To test the physical properties of ingredients of concrete like cement, fine and coarse aggregates.

II. To understand the concept and procedure of different tests conducted on fresh and hardened concrete.

III. To gain knowledge of proportioning a concrete mix for given specification of ingredients.

It is a representative list of experiments. The instructor may choose experiment as per his/her requirements (so as to cover entire contents of the course CEU424) from the list or otherwise. Minimum eight practicals should be performed. From the group of experiments given below, tests of groups 1, 3,6and8 are compulsory while other tests are chosen from remaining groups as required.

Group of Experiments:

1. Tests on cement -I : Fineness, standard consistency and setting time (initial and final)
2. Tests on cement -II : Soundness and compressive strength
3. Tests on fresh concrete – I : Workability tests i.e. slump test, compaction factor test, flow table test
4. Tests on fresh concrete – II: Effect of admixture on workability and setting time of concrete (plasticizer, super plasticizer, retarder)
5. Tests on aggregates – I : Bulk density and void ratio of fine and coarse aggregates, aggregate crushing value

6. Tests on hardened concrete I : Compressive strength, flexural strength, split tensile strength, modulus of elasticity and modulus of rupture of concrete
7. Tests on hardened concrete II : Non-destructive tests i.e. Rebound Hammer Test, Ultra sonic pulse velocity test
8. Concrete mix design as per IS specifications.
9. Tests on bricks: Compressive strength, water absorption and efflorescence test.

Course Outcomes:

After completion of course students will be able to:

CEU429.1 Assess the different physical properties of cement, fine and coarse aggregates at field and in lab to decide their suitability for making concrete.

CEU429.2 Determine the properties of fresh and hardened concrete to assess quality of concrete.

CEU429.3 Design concrete mix as per IS specifications.

Note-

ICA- The internal continuous assessment shall be based on practical record and knowledge/ Skills acquired. The performances shall be assessed experiment wise using continuous assessment formats.

ESE- The End Semester Exam for practical shall be viva-voce.

GOVT. COLLEGE OF ENGINEERING, AMRAVATI

CURRICULUM

B. TECH. (CIVIL ENGG.)
V and VI Semester

Department of Civil Engineering

ANNEXURE B - REVISED CURRICULUM STRUCTURE OF B. TECH. CIVIL ENGINEERING - 2012

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI.

Department of Civil Engineering.

B. Tech. (Civil Engineering)

SEM III

		Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
Course Code	Name of the Course	Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
SHU301	Engineering Mathematics-III	3	--	---	3	10	15	15	60	---	---	100	3
CEU301	Engineering Geology & Hydrology	3	---	---	3	10	15	15	60	---	---	100	3
CEU302	Fluid Mechanics	3	1	---	4	10	15	15	60	---	---	100	4
CEU303	Strength of Materials	3	1	---	4	10	15	15	60	---	---	100	4
CEU304	Building Construction & Materials	3	---	---	3	10	15	15	60	---	---	100	3
SHU305	General Proficiency II	1	---	2	3	---	---	---	---	25	25	50	2
CEU305	Engineering Geology & Hydrology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU306	Fluid Mechanics Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU307	Strength of Materials Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU308	Building Construction & Materials Lab	---	---	2	2	---	---	---	---	25	25	50	1
	Total	**16**	**2**	**10**	**28**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**23**

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min.

SEM IV

		Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
Course Code	Name of the Course	Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
CEU401	Engineering Economics & Humanities	3	--	---	3	10	15	15	60	---	---	100	3
CEU402	Transportation Engineering	3	1	---	4	10	15	15	60	---	---	100	4
CEU403	Surveying	3	1	---	4	10	15	15	60	---	---	100	4
CEU404	Concrete Technology	3	---	---	3	10	15	15	60	---	---	100	3
CEU405	Open Channel Flow & Hydraulic Machines	3	1	---	4	10	15	15	60	---	---	100	4
CEU406	Transportation Engineering Lab	---	---	2	2					25	25	50	1
CEU407	Surveying Lab	---	---	4	4	---	---	---	---	50	50	100	2
CEU408	Concrete Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU409	Open Channel Flow & Hydraulic Machines Lab	---	---	2	2	---	---	---	---	25	25	50	1
	Total	**15**	**3**	**10**	**28**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**23**

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min.

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SEM V

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU501	Theory of Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU502	Design of Steel Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU503	Building Design & Drawing	2	---	---	2	10	15	15	60	---	---	100	2
CEU504	Advanced Surveying	3	---	---	3	10	15	15	60	---	---	100	3
CEU505	Water Treatment Process & Technology	3	---	---	3	10	15	15	60	---	---	100	3
CEU506	Design of Steel Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU507	Building Design & Drawing Lab	---	---	4	4	---	---	---	---	50	25	75	2
CEU508	Advanced Surveying Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU509	Water Treatment Process & Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU510	Self Study-I	---	---	----	--	25	---	---	---	---	---	25	2
Total		**14**	**2**	**10**	**26**	**75**	**75**	**75**	**300**	**125**	**100**	**750**	**23**

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CEU502 and CEU503 for which the ESE duration will be 3 hrs.

Self study-I is based on one class test each, on the basis of 20% curriculum of the courses CEU501, CEU503, CEU504 and CEU505 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study I and his/ her teaching work load shall be considered as one hr/week.

SEM VI

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU601	Design of Reinforced Concrete Structures	3	--	---	3	10	15	15	60	---	---	100	3
CEU602	Geotechnical Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU603	Water Resources Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU604	Construction Management	3	---	---	3	10	15	15	60	---	---	100	3
CEU605	Estimating & Costing	3	---	---	3	10	15	15	60	---	---	100	3
CEU606	Design of Reinforced Concrete Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU607	Geotechnical Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU608	Water Resource Engineering Lab	---	---	2	2	---	---	---	---	25	-	25	1
CEU609	Estimating & Costing Lab	---	---	2	2	---	---	---	---	25	-	25	1
CEU610	Minor Project	----	----	2	2	---	----	---	----	25	25	50	2
CEU611	Self Study-II	---	---	----	--	25	---	---	---		---	25	2
CEU612	Industrial Lecture-I*	1	---	----	1	---	---	---	---	---	---	---	---
Total		**16**	**0**	**10**	**26**	**75**	**75**	**75**	**300**	**125**	**75**	**725**	**23**

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CEU601 and CEU605 for which the ESE duration will be 3 hrs.

*** Credits shall be awarded on the basis of combined assesment of CEU612 and CEU710.**

Self study-II is based on one class test each, on the basis of 20% curriculum of the courses CEU601, and CEU602, CEU603, CEU604 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study II and his/ her teaching work load shall be considered as one hr/week.

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SEM VII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU701	Advanced Theory of Structures	3	---	---	3	10	15	15	60	---	---	100	3
CEU702	Foundation Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU703	Elective-I	3	---	---	3	10	15	15	60	---	---	100	3
CEU704	Interdisciplinary Elective	3	---	---	3	10	15	15	60	---	---	100	3
CEU705	Advanced Theory of Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU706	Foundation Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU707	Software in Civil Engg Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU708	Project-Phase-I	---	---	4	4	---	---	---	---	100	--	100	2
CEU709	Industrial Visit / Training	---	---	---	--	---	---	---	---	50	---	50	2
CEU710	Industrial Lecture-II*	1	---		1	---	---	---	---	25	---	25	1
CEU711	Self Study-III	---	---	---	--	25	---	---	---	---	---	25	2
CEU712	Seminar	---	---	---	--	--	---	---	---	25	---	25	1
	Total	**13**	**0**	**10**	**23**	**65**	**60**	**60**	**240**	**275**	**75**	**775**	**23**

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CE U701 for which the ESE duration will be 3 hrs.

Students of this department shall select any one Interdisciplinary Elective offered by other department. Interdisciplinary Elective shown below will be offered to students of other department.

*** Credits shall be awarded on the basis of combined assesment of CEU612 and CEU710.**

Self study-III is based on one class test each, on the basis of 20% curriculum of the courses CEU701, CEU702 and CEU703 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study III and his/ her teaching work load shall be considered as one hr/week.

SEM VIII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU801	Advanced Structural Design	2	---	---	2	10	15	15	60			100	2
CEU802	Environmental Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU803	Elective -II	3	---	---	3	10	15	15	60	---	---	100	3
CEU804	Elective -III	3	---	---	3	10	15	15	60	---	---	100	3
CEU805	Advanced Structural Design Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU806	Environmental Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU807	Elective -II Lab	---	---	2	2	---	---	---	---	25	---	25	1
CEU808	Elective -III Lab	---	---	2	2	---	---	---	---	25	---	25	1
CEU809	Project	---	---	6	6	---	---	---	---	75	100	175	6
CEU810	Self Study-IV	---	---	---	--	25	---	---	---		----	25	2
	Total	**11**	**0**	**14**	**25**	**65**	**60**	**60**	**240**	**175**	**150**	**750**	**23**

TA :Teacher Assessment   CT: Class Tests   ESE: End Semester Examination   ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CE U801 for which the ESE duration will be 3 hrs.

Self study-IV is based on one class test each, on the basis of 20% curriculum of the courses CEU801, CEU802, CEU803 and CEU804 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study IV and his/ her teaching work load shall be considered as one hr/week.

Electives

CEU703 Elective-I	CEU704 Interdisciplinary Elective	CEU803 Elective-II	CEU804 Elective-III
A) Advanced Structural Analysis	A) Optimization and Modeling	A) Structural Dynamics	A) Hydraulic Structures
B) Advanced Soil Mechanics	B) Industrial Building Planning & Design	B) Earthquake Resistant Design	B) Advanced Design of Steel Structure
C) Matrix Analysis of Structures	C) Interior Designs & Drawing	C) Pavement Design & Construction	C) Finite Element Method
D) Environmental Pollution & Solid Waste Management	D) Project Management	D) Advanced Wastewater Treatment	D) Ground Improvement Technology
E) Railways, Tunnels & Airport Engineering	E) System Engineering	E) Advanced Foundation Engineering	E) Remote Sensing & GIS
F) Advanced Fluid Mechanics		F) Advanced Construction Management	F) Advanced Water Treatment Process & Technology

CEU 501- THEORY OF STRUCTURES

Teaching Scheme: 03 L + 01 T Total: 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2 hrs. 30 min

Classification of Structures: Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.

Slope and deflection: Castigliano's theorem for slope and deflection, Unit load method, slope and deflection in determinate beams and portals, Deflection in determinate trusses.

Influence line diagrams: Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, absolute maximum shear force and bending moment, Influence line diagrams for reactions, bending moment and shear force for determinate beams, Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.

Three hinged arches: Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Slope deflection method: Analysis of continuous beams with and without sinking of support. Analysis of portal frames without side sway.

Moment Distribution method: Analysis of continuous beams with and without sinking of support and portal frames without side sway.

Text Books:

1. Basic Structural Analysis, Reddy C. S., 2nd edition, Tata – McGraw Hill, New Delhi, 2004.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc, 1983

Reference Books:

1. Elementary Structural Analysis, Utku, Norris and Wilbur, 4th Edition, McGraw Hill Inc, 1991
2. Structural Analysis, R.C. Hibbler, 4th Edition, Prentice Hall, 1999
3. http://www.nptel.iitm.ac.in

CEU 502 DESIGNS OF STEEL STRUCTURES

Teaching Scheme: 03 L + 01T Total: 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 3hrs.

Materials, structures and specifications: types of structural steel, mechanical properties of steel, advantages of steel as a structural material The basis of structural design-design consideration, code and specifications**,** Failure criteria for steel.

Design Approach: Factor of safety, Permissible and working stresses, Elastic Method, Plastic method, Introduction to Working stress Method and Limit state method

Loading and load combination-loads-dead loads, imposed loads, temperature effect, earthquakes, determination of wind loads as per IS 875(part 3), load combinations

Designs using Limit State Method:

Connections:
Riveted connections-Introduction
Welded connections: Advantages of welding, types and properties of weld, types of joint, weld symbols, design of welds, simple joints, moment resistant connections
Bolted connections: Behaviour of bolted connections, design strength of ordinary black bolt, simple connection, moment resistant connection

Design of tension member: Types of tension member, factors affecting strength of tension member, design of tension member

Design of compression members: Possible failure modes, classification of cross section, section used for compression members, effective length, single angle strut, built up compression members, column splicing for axial loads only.

Design of simple beams: Behaviour of beams in bending, design strength of laterally supported beams in bending, design strength of laterally unsupported beams in bending, maximum deflection, web buckling and crippling, introduction to plate girder design (no numerical problems on plate girder design)

Design of beam column: General behaviour of beam column, interaction between beam-column and structure, beam column under biaxial bending

Design of column bases: Types of slab bases, design of solid slab base for axial & eccentric loading

Text books :

1. Design of Steel Structures, N. Subramanian, 1st Edition , Oxford University Press, India, 2008
2. Design of Steel Structures (By Limit State Method as Per IS: 800—2007), S.S. Bhavikatti, 1st Edition , I. K. International Pvt Ltd, 2009

Reference books:

1. BIS 800-2007, Code of practice for general construction in steel, BIS New Delhi
2. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than earthquake) for Buildings and Structures, BIS, New Delhi
3. SP 6 (Part I to Part 6) Handbook for structural engineers - Structural steel sections.
4. http://www.nptel.iitm.ac.in

CEU503 BUILDING DESIGN & DRAWING

Teaching Scheme: 02 L + 00 T Total: 02 **Credits: 02**
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**
Duration of ESE: 3hrs.

Introduction: Importance of building drawing in construction & estimation, Selection of scales, dimensioning in architectural drawing, Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS:962. Layout of sheet for Civil Engineering drawing.

Working Drawings of building: Concept of line plan & working drawings of the building, Combined first angle & third angle method of projection, Developing working drawings of the building from the given line plan. Details to be incorporated in the working drawings, Necessity and use of working drawing, Site plan, Block plan, Layout plan, Foundation plan, Developing working drawings and foundation plans, Layout plans for load bearing and framed structures.

Planning of residential building: Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement, Climate and design consideration, Orientation of buildings, requirement of the owner,. Provision of mezzanine floor, balconies and porches in the building. Common sizes of doors & windows, Common utilities such as parking, security, water supply, sanitation, etc. for apartments

Free hand sketches of building components and elevation features such as balconies, sun shades and sun breakers, grills, compound walls, compound gates, grill doors, door panel designs, window frame design, etc

Building rules and bye-laws: for residential buildings, conversion of land to nonagricultural lands, layout for a housing project, alternatives of building types viz. individual bungalows, semi-detached houses, row houses, apartments, Rules governing Plot area, Built-up area, Floor space Index, Building line, Set back, side margins, height of building, Provisions as per NCB

Planning of Public buildings: Types of public building and their requirements, planning of public buildings such as School Buildings, College Buildings, Hospitals, Primary Health Center, Multiplex, Shopping Complex

Plan sanctioning: Requirements of drawing as per plan sanctioning authorities

Text books:

1. Building Drawing, Shah M.G., Kale & Patki, Tata McGraw Hills Publishing Co., New Delhi
2. Architectural Working Drawings: Residential and Commercial Buildings, Spence William P., 1993

Reference books:

1. IS: 962-1989, Code of practice for architectural and building drawings, BIS, New Delhi.

2. AutoCAD Workbook for Architects, Shannon Kyles, Wiley-Blackwell, July 2008
3. Architectural Graphic Standards for Residential Construction: The Architect's and Builder's Guide to Design, Planning, and Construction Details, The American Institute of Architects, John Wiley & Sons, 2003.

CEU504 ADVANCED SURVEYING

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs. 30 min

Control of Survey – Traverse, Types of Traverse, Traverse Surveying, Deflection Angle Traverse, Interior **Angle Traverse,** Latitudes and departure and its computation, Consecutive & independent co-ordinates, Gales Traverse table, checks in a closed traverse & an open traverse, error of closure

Theodolite Traversing: Locating details in a Theodolite traverse, angle mis-closure, balancing the angles of the traverse,

Total Station Traversing: Selecting a job, scale factor setting, azimuth angle setting, entering instrument station data, recording back sight point, recording angle measurement data, recording distance measurement data, recording notes, calculating azimuth angle by coordinates, coordinate resection measurement, height resection measurement, offset measurement, single distance measurement, angle offset measurement, two-distance offset measurement, registering known point data, reviewing known point data, reading in registered coordinate data

Tachometry: Purpose & advantages, Systems of Tachometric Measurement, Stadia systems and Non-stadia systems, Fixed hair method, Tangential method, subtanse method, Principle of Stadia methods, determination of Tachometric constants, analytic lens, inclined stadia measurements, errors in stadia measurement.

Route Surveying: Simple circular curves -its elements, Designation & Degree of curve, Chord & Arc definition, Fundamental Geometry, Methods of setting out simple circular curves- chain & tape method, Rankin method, Two Theodolite method, obstacles in setting out curves
Transition curve: Purpose, length of transition curve, Ideal transition curve, characteristics of transition curve, computation of combined curve, procedure of setting out combined curve
Compound curve, theory and methods of setting out compound curves
Vertical curves: Requirement, Types, properties, Length, location of highest or lowest point

City Surveying: Control, equipment, topographic map, underground map, city property, survey, location of details

Underground Surveying: Surface alignment, correlation of surface and underground surveys, transferring levels underground, underground bench marks, setting out of pipelines and sewers

Hydrographic Surveying: Necessity, control, shore line survey, river survey, gauges, sounding equipment and procedure of taking sounding, methods of locating sounding, three point problem- mechanical & graphical solutions

Photogrammetric Surveying: Introduction, Basic principle, Photo-Theodolite, basic definitions, geometry of aerial and terrestrial photographs, Aerial photogrammetry, aerial camera, ground control for photogrammetry.

Remote Sensing & GIS: Introduction, application for survey.

Text Books:

1. Surveying & Leveling, Basak N., 1st Edition , Tata McGraw Hill, 2004.
2. Surveying Vol. I and II, Duggal S.K., 2nd Edition , Tata McGraw Hill, 2004.

Reference Books:

1. Surveying & Leveling Practice, Anderson J. M. and Mikhail E. M., 7th Edition, McGraw Hill, 1998.
2. Surveying Principles and Applications, Kavanagh, 7th Edition, Prentice Hall, 2007.
3. Surveying Fundamentals & Practices, Nathanson, Lanzafama and Kissam, 5th Edition, Prentice Hall, 2006.
4. Surveying, Moffitt and Bossler, 10th Edition, Prentice Hall, 1998.
5. http://www.nptel.iitm.ac.in

CEU 505 – WATER TREATMENT PROCESS AND TECHNOLOGY

Teaching Scheme: 03 L + 0 T, Total: 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2 Hrs. 30 Min.

Sources of water: Surface water, Ground water, Infiltration galleries, relative suitability; Intake works, functions, types.

Water quality: Impurities in water: Turbidity, pH, Chlorides, Hardness, Residual Chlorine, Fluoride, MPN, Significance, Water quality standards

Demand of water: Water demand for domestic purposes, Fire demand, Per capita demand, Factors affecting consumption, Fluctuation in demand: Design period for water supply components, Population forecast: Arithmetical increase, Incremental increase, Geometrical increase, and Logistic curve methods

Distribution system: Types of distribution system: Continuous and intermittent supply systems, Gravity, Pumping and combined systems; Layout of distribution system: Dead end, Grid iron, Circular, and Radial systems; Major Losses & Minor Losses, Analysis of distribution system: Hardy Cross method, Service Reservoirs: Elevated service reservoir, Balancing reservoir, Necessity, Location, Capacity calculation by Mass curve method

Water Treatment: Flow diagram of conventional WTP; Aeration: Principle, Purpose, Design of cascade aerator; Flash mixer, function, design, power requirement; Flocculation: Coagulants, quantity of coagulants, Design of mechanical flocculator; Sedimentation: General equation for settling of discrete particles, Plain settling tank, Tube settler, Design of settling tank, Surface over flow rate, Detention period; flow through velocity, weir loading, design of Clariflocculator

Filtration: Objective, Filter Media, Rapid and slow sand filters: Number of filter units, Rate of filtration, Under drainage system, Backwashing, Negative head, Operation and cleaning, Design of slow and rapid sand filters, Design of under drainage system, Pressure filter

Disinfection: Objectives, Methods of disinfection, Chlorination: Free and combined chlorine, Residual chlorine, Effect of pH, Bleaching powder, Types of chlorination, Pre-chlorination, Post-chlorination, Break point chlorination, Super chlorination

Tertiary treatments: Softening: Lime soda, Quantity of lime and soda, Ion exchange; Effect of fluoride, Fluoridation and De-fluoridation

Text Books:

1. Environmental Engineering, H. S. Peavy, D. R. Rowe and T. George, McGraw-Hill Book Company, New Delhi, 1985.
2. Environmental Engineering, Gerard Kiely, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

Reference Books:

1. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Government of India Publication, New Delhi, 1993
2. Water Treatment Processes, S. Vigneswaran and C. Visvanathan, CRC Press, Boca Raton, Florida, USA, 1995.
3. Environmental Engineering, A. P. Sincer and G. A. Sincero, Prentice-Hall of India Private Limited, New Delhi, 2004.
4. Water Supply and Waste Water Disposal, Fair G. M. and Geyer J. C., John Wiley and Sons, Inc., New York, 1968.
5. http://www.nptel.iitm.ac.in

CEU 506 DESIGN OF STEEL STRUCTURES -LAB

Teaching Scheme: 02 P Total: 02 **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
Duration of ESE: 3hrs.

PART 1. A Lab report & Structural drawings (using AutoCAD & manually) for the following

1. Analysis of roof truss
2. Design of members of roof truss
3. Design of purlin
4. Design of beam (Laterally supported and laterally unsupported)
5. Design of connections in roof truss
6. Design of bolted connection (simple and moment connection)
7. Design of welded connection (simple and moment connection)
8. Design of Column (Axially loaded)
9. Design of Beam-Column
10. Design of Slab base

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

PART 2: Field visit on Steel Structure / Industrial Building / Railway Station / Bridges / Plate girders and submission of the report.
A Lab Report based on above experiments shall be submitted by each student

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on oral examinations on the term work.

CEU507 BUILDING DESIGN & DRAWING LAB

Teaching Scheme : 04P Total: 04 **Credits : 02**
Evaluation Scheme : 50 ICA + 25 ESE **Total Marks :75**
Duration of ESE: 3hrs.

PART 1 – MANUAL DRAWING

Developing following drawings on full imperial size sheets:

1. Developing working drawing of single storied residential building from the given line plan. (Load bearing structure).
2. Preparing line plan of residential building from the given data on the graph paper and developing its submission drawings as per requirement of the plan sanctioning authority (Load bearing structure/Framed structure) (Separate data should be given to group of students)
3. Developing line plan of any two public building from the given data on A2 size graph paper.
4. Sketch book containing at least 10 free hand sketches of building components and elevation features such as balconies, sun shades and sun breakers, grills, compound walls, compound gates, grill doors, door panel designs, window frame design, Furniture placement in rooms, kitchen layout, plumbing layout etc.

PART 2 – CAD DRAWING

1. **AutoCAD commands**

   Drawing commands – Point, Line, Rectangle, Arc, Hatch, Text, Table, Use of Osnap

   Dimensioning – Linear, aligned, continue dimensioning

   Formatting – point style, line weight, line types, colour, text style, dimension style, table style, units

   Editing commands – selecting objects, various methods of selection, Erase, Move, Copy, Break, Mirror, Rotate, Scale, Trim, Extend, Offset

   Blocks- making and inserting blocks

   Zooming and Panning

   Saving & Printing the drawing – selection of scale

2. **AutoCAD Drawings**

   Creating Working Drawings in AutoCAD of single storied residential building from the given line plan same as in exercise 1 of Part I and taking printouts.

Term work shall consist of following

1. Folder consisting of A1 size drawing sheet created in practical 1 and A2 size graph paper of practical 3 of Part1.
2. Sketch book containing at least 10 free hand sketches of building components.
3. Printouts of Working Drawings of single storied residential building created in AutoCAD.

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in AutoCAD and may be followed by sample questions.

CEU508 – ADVANCED SURVEYING - LAB

Teaching Scheme: 02 P Total: 02 **Credits: 01**
Evaluation Scheme: ICA 25 + ESE 25 **Total Marks: 50**
Duration of ESE: 3hrs.

List of Experiments

1. **Theodolite traversing** – Locating details, traverse calculations, traverse adjustment by Gales traverse table, Plotting the traverse and details on A1 size drawing sheet.

2. **Total Station traversing** – Selecting a job, entering instrument station data, recording back sight point, recording angle measurement data, recording distance measurement data, offset measurement

3. Finding out tacheometric constants of given tacheometer

4. Finding out horizontal and vertical distances between given points using tacheometer

5. Setting out simple circular curves by various methods.

6. To find the location a given point on the field using GPS receiver

A Lab Report based on above experiments shall be submitted by each student.

Note:
ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions.

CEU 509 – WATER TREATMENT PROCESS AND TECHNOLOGY LAB

Teaching Scheme: 02 P Total: 02 **Credits: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
Duration of ESE: 3hrs.

Part A: Analysis of water samples: Minimum six experiments from the following:

i. Determination of pH of given/collected water sample
ii. Determination of Hardness of given/collected water sample
iii. Determination of Chloride content of given/collected water sample
iv. Determination of DO of given/collected water sample
v. Determination of Alkalinity of given/collected water sample
vi. Determination of Acidity and Turbidity
vii. Determination of Total solids of given/collected water sample
viii. Determination of Iron content of given/collected water sample
ix. Determination of Calcium content of given/collected water sample
x. Determination of Residual chlorine of given/collected water sample
xi. Determination of Alum Dose for given/collected water sample

Part B: Minimum two Design problems on course topics such as design of settling tank, flocculator, tube settler, rapid sand filter etc.
Part C: Visit to Water Treatment Plant. Visit report shall be in brief consisting of layout of plant, Necessity of units, Design details such as: flow, size, and specification etc along with cross-section of each unit

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

A Lab Report based on above experiments shall be submitted by each student
Note:
ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.
ESE: The End Semester Examination for Practical shall be based on the performance in one of the experiments / design problems and may be followed by sample questions.

CEU 510 – SELF STUDY- I

Teaching Scheme: 00L + 00 T Total 00 **Credits: 02**
Evaluation Scheme: 25 ICA + 00 ESE **Total Marks: 25**
Duration of ESE: 3hrs.

Self study-I is based on one class test each, on the basis of 20% curriculum of the courses CEU501, CEU503, CEU504 and CEU505 to be declared by respective course coordinator at the beginning of the semester. These class tests should be conducted separately for each course and after CT2. The marks of all such class tests then shall be converted to out of 25. One faculty member shall be appointed as course coordinator for Self Study I and his/ her teaching work load shall be considered as one hr/week.

CEU 601 DESIGNS OF REINFORCED CONCRETE STRUCTURES

Teaching Scheme: 03 L + 00 T   Total: 03   Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 3hrs.

Concept of reinforced concrete: History of RCC, objectives and methods of analysis & design, properties of concrete and steel, philosophies of design, working stress method: concept, rectangular beams under flexure, numerical problems,

Limit state method: Limit state of collapse - flexure (theories and examples), computation of parameters of governing equations, numerical problems on singly reinforced rectangular beams, doubly reinforced beams – theory & problems

Reinforced Concrete Slabs: One-way slabs, two-way slabs-Design and reinforcement detailing

Beams: Rectangular & flanged beams – theory and numerical problems, design for shear, bond, and development length

Columns: Limit state of collapse, design of short columns subjected to axially load, axial load with uniaxial bending & axial load with biaxial bending, slender columns

Foundations: Theory, Design of isolated square and rectangular footings subjected to axial load and bending moment (uniform depth only)

Staircases: Types and Design of doglegged Staircase

Introduction to Earthquake Resistant Design of Structures: Seismic Effects, Material Behaviour and General Principles of Earthquake Resistant Design of structures, ductile design and detailing of Earthquake Resistant Structures

Text Books:

1. Reinforced Concrete Design, Pillai S. U. and Menon Devadas., 3rd Edition, Tata Mc Graw Hill, New Delhi, 2009.
2. Illustrated Reinforced concrete Design, Shah V. L, Karve S. R 3rd Edition, Structures Publishers, Pune, 2008

Reference Books:

1. Design of Concrete Structures, Nilson A. H., Darwin D. and Dolan C. W.,3rd edition Tata Mc Graw Hill, New Delhi 2005.
2. “Fundamentals of Reinforced concrete design” M.L. Gambhir, Prentice Hall of India Private Ltd., New Delhi, 2004.
3. Advanced Reinforced Concrete Design, Varghese P.C., Prentice – Hall of India Pvt Ltd, New Delhi.
4. Limit State Designs of Reinforced Concrete, Varghese P.C., 2nd Edition, Prentice – Hall of India Learning, New Delhi, 2009.
5. “Fundamentals of reinforced concrete” N.C. Sinha and S.K Roy 4th Edition S. Chand Publishers, 2009.

6. “Reinforced concrete design” N. Krishna Raju and R.N. Pranesh 8th Edition New age International Publishers, New Delhi, 2004.
7. BIS 456-2000, Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi
8. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than earthquake) for Buildings and Structures, BIS, New Delhi
9. SP 16 Design aids for reinforced concrete to IS 456 BIS, New Delhi
10. SP 24 Explanatory Handbook of Indian standard code of practice for plain & reinforced concrete BIS, New Delhi
11. SP34 Handbook on concrete reinforcement & detailing (with amendment 1) BIS, New Delhi.

CEU602- GEOTECHNICAL ENGINEERING

Teaching scheme: 03 L + 00T Total: 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Introduction: Introduction to Geotechnical Engineering, Soil formation and soil types, Regional soil deposits of India, Problems related to soils during construction.

Phase systems: Basic definitions and phase relationship, Index properties of soil & method of determination; Soil structures.

Classification of soils: Textural classification, Indian standard classification system, classified soils and its engineering properties.

Soil compaction: Laboratory compaction, factors affecting compaction, structure and engineering behavior of compacted soil, Compaction in field, compaction equipment, compaction specification and field control.
Soil water statics, concept of effective stress

Permeability: Darcy's law, laboratory and field methods of determination of coefficient of permeability of soil, factors affecting permeability, approximate coefficient of permeability of common soils.

Seepage analysis: Quick condition, Flow net and its properties, graphical method of flow net construction, determination of seepage by flow net, seepage force.

Stress Distribution: State of stress at a point, stress distribution in soil mass, Boussinesq theory and its applications, pressure distribution diagrams, Newmark's chart

Shear strength of soil: Mohr's circle of stress, Concept of failure, Mohr-Coulomb failure criterion, Determination of shear strength parameters of soil in laboratory by various methods, Effective and total stress shear strength parameters; Shear strength characteristics of clays and sands.

Consolidation: Spring analogy, Terzaghi's theory of one-dimensional consolidation (no derivation), solution of the consolidation equation, Laboratory consolidation test & Evaluation of compressibility and consolidation parameters, determination of pre-consolidation pressure.

Text Books:

1. Geotechnical Engineering, Venkatramaiah C., 3rd Edition New Age International (P) Ltd., Publishers, New Delhi, 2006.
2. Textbook of Soil Mechanics and Foundation Engineering, Murthy V. N. S., CBS Publishers & Distributors Pvt. Ltd. India, 2008 .

Reference Books:

1. Principles of Geotechnical Engineering, Das B. M., 7th Edition, Cengage Learning, Inc, Stamford, USA, 2010.

2. Soil Mechanics and Foundations, Muniram Budhu, 2nd Edition, John Wiley & Sons Publishers, 2007.
3. Geotechnical Engineering, Gulhati S. K. and Datta M., 1st Edition, Tata McGraw Hill Publishing Company, New Delhi, 2005.
4. SP: 36 (Part 1), Compendium of Indian Standards on Soil Engineering, Part 1, BIS New Delhi, 2001.
5. http://www.nptel.iitm.ac.in

CEU603 WATER RESOURCES ENGINEERING

Teaching Scheme : 03 L + 00 T Total: 03 Credit : 03
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks :100
Duration of ESE: 2hrs.30 min.

Introduction: Irrigation Necessity, benefits of irrigation, Standards of irrigation water.

Estimating Irrigation Demand: Cropping seasons & base period, Principal Indian crops and their cropping seasons, Duty and Delta, Factors affecting Duty, Consumptive use of water-Experimental & theoretical methods, Gross command area, Irrigable command area, Culturable command area, Intensity of Irrigation, Determining the crop water requirement.

Types of Irrigation Schemes: Classification of Irrigation Projects, Direct & Indirect methods, Irrigation Project Structure

Minor Irrigation works: General layout and components of Bandhara irrigation scheme and percolation tank scheme, selection of suitable site, advantages & disadvantages, Selection of site and layout of Diversion Head Works, its components

Lift Irrigation: Necessity and general layout, main components

Planning of Water Storage Reservoir: Selection of site, various investigations, Area-capacity curve, Reservoir storage zones, Planning of reservoir, Effect of sedimentation, Life of reservoir and design criteria, Fixing capacity of reservoir, Fixing of Dead Storage & live storage, Fixing of flood and surcharge storage, Fixing Control levels, Control of sedimentation in reservoir.
Different types of Dams and their suitability, factors governing the selection of types of dam,

Design & construction of Gravity Dams: Typical layouts of gravity dam, Typical non-overflow section of concrete gravity dams, different components, Galleries-Types and their functions, The expected loadings for gravity dams –different forces acting, Earthquake and its effect on dams, Design steps for of concrete gravity dam sections- Criteria for safe design, Elementary and Practical profile of gravity dam, Stability analysis of gravity dam sections, Construction processes for gravity dams, Different types of Joints, Instrumentations in concrete dams.

Spillway: Types of spillway, Hydraulic design of Ogee-spillway, energy dissipation below spillway including its type, Design of stilling basin as per IS code, Different types of crest gates

Earthen dams: Types and elements of earth dam, causes of failure, seepage and drainage arrangement, phreatic line, Typical cross section of zoned section – components and their functions, Criteria for safe design, design of section, stability analysis, seepage control measures

Canals: Layout of canal system, Types of canals, Canal alignment, Typical cross-sections, Design of Canals, Balancing depth, cross section of canal, purpose and types of canal lining, maintenance of canals

Canal structures: Types, Canal falls, Head Regulator, Cross regulator, Canal escapes and canal outlets, Aqueduct, Siphon aqueducts, super passage, canal siphon, level crossing.

Text books:

1. Irrigation Water Resources and Water Power Engineering, Dr. P.N. Modi, Standard Book House, New Delhi, 2009.
2. Irrigation Engineering and Hydraulic Structures, R. K. Sharma, Oxford and IBH Publishing Company, New Delhi, 1994.

Reference books:

1. Concrete Dams, R. S. Vershney, Oxford and IBH Publishing Co., New Delhi, 1982.
2. Theory and Design of Irrigation Structures, R.S. Varshney, S. C. Gupta and R.L. Gupta, Nemchand & Brothers, Roorkee, 1992.
3. Water Resources Engineering, R.K. Linsley and J.L.H. Paulhus, McGraw Hill Book Co., 1992.
4. http://www.nptel.iitm.ac.in

CEU 604 - CONSTRUCTION MANAGEMENT

Teaching Scheme : 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

General Management: Evolution, applicability, definition, theories, Comparison between traditional management and modern scientific management, roles of Frederick Winslow Taylor, Henry Fayol, Elton Mayo, Mary Parker Follet, A.H. Maslow and Douglas Mcgregor. Management functions and Management styles.

Project management: Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality , project clearance Procedures and necessary documentation for major works like dam, multi-storied structures, ports, tunnel, bridges, roads.

Resource Planning and Scheduling: PERT/CPM: Critical path theory and application. Bar chart, Grant chart, Construction Scheduling – Work break down structure, activity cost and time estimation in CPM, PERT

Materials Management: Role and objectives of materials management, Materials Procurement and Delivery, Inventory control- EOQ techniques

Construction Equipment: Choice of Equipment and Standard production Rates, Economic Cost of Equipment, Replacement analysis, downtime cost and obsolescence costs.

Personnel management: Importance, functions and mechanism of implementation of the functions.

Site management: Site layout and plan

Text Books:

1. Construction Equipment and its Planning and Application, Dr. Mahesh Varma, Metropolitan Book Company, New Delhi-, 1983.
2. Construction Accounting and Financial Management, William Palmer, 5th edn, McGraw-Hill Professional Publishing, 1999.

Reference books:

1. Construction Project Management Planning, Scheduling and Controlling- B. Sengupta & H. Guha , Tata McGraw Hill, New Delhi
2. Principles of Construction Management, Roy Pilcher, 3rd edition, McGraw-Hill, June 1992.
3. CPM in Construction Practices, Antil and Wood Head, 4th edn., John Wiley Pub., 1990.
4. Materials Management, D. S. Ammer, 3rd edn., Pub.: R. D. Irwin, 1974
5. CPM in Construction Management – James O'Brien, Tata McGraw Hill, New Delhi, 6th edn., 1999.
6. http://www.nptel.iitm.ac.in

CEU605 ESTIMATING & COSTING

Teaching Scheme : 03 L + 00 T Total 03 **Credits : 03**
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks :100**
Duration of ESE: 3hrs.

Modes of Measurement: Modes of Measurement and units of measurement as per IS:1200.

Types of Estimate: Various methods of estimation.

Cost Building up: Purpose and principles, importance of schedule of rates in cost estimates.

Specifications: Purpose and principles of specification writing, Types of specification.

Rate analysis: Factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost.

Cost and Quantity Estimate: Detailed Estimate, Forms used, Detailed estimates of various civil engineering structures, Working out quantities of various materials required for construction. Earth work estimates in roads including hill road.

Cost Accounting: Various methods, classification of cost, direct and indirect charges, distribution of overheads, MAS account, issue rate of store accounts.

Valuation: Purpose of valuation, value and cost, market value, potential value, Sentimental value, scrap value etc. Net and gross return, Free hold and lease hold property, Sinking fund, Depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building.

Organization of construction industry: Govt. organization, PWD organization, site administration,, BOT, Role of Government department as a construction agency,

Contracts: types of contracts, Tender and Tender documents, E- Tender, Arranging contract works, methods of carrying out works, Indian contract law and Engineering contracts, land acquisition, Act, Legal aspects of various contract provision.

Tendering: Procedure adopted for tendering and contracting the major projects, various terminologies associated with tendering, contracting and execution of the major projects, Preparation of DPR, Analysis of project cost.
Concept of DBFOT, PMC, EPC,RFQ, RFP, LOA, CA, Concessionaire, Independent consultant, Design consultant, Escrow account, Project agreements

Text books:

1. Estimating and Costing in Civil Engineering, Theory and Practice, Datta B.N., 23rd Edition, UBS Publisher, New Delhi, 2003.
2. Estimating Building Cost, Popescu C. M., Phaobunjong Kan and Nuntapong Ovararin Dekker Publication

Reference Book

1. Estimating and Costing, Patil B. S., Oriental Longmans Publication, New Delhi.
2. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New Delhi
3. Recent ‘Current Schedule of Rate” published by Public works Department

CEU606 DESIGN OF REINFORCED CONCRETE STRUCTURES – LAB

Teaching Scheme: 02 P Total: 02 **Credits: 01**
Evaluation Scheme: ICA 25 + ESE 25 **Total Marks: 50**
Duration of ESE: 3hrs.

PART I: Designs of different structural elements of a single storey building:

1. Design of simply supported slab
2. Design of cantilever slab
3. Design of one-way continuous slab
4. Design of two-way slabs having different boundary conditions
5. Design of beams for different support conditions such as simply supported, Fixed, continuous, and different types such as rectangular (singly/doubly), and Flanged beams(T-beam/ L-beams)
6. Design of Columns (Axially loaded, uniaxially and biaxially eccentrically loaded)
7. Design of Column footings (Axially loaded, uniaxially and biaxially eccentrically loaded)
8. Design of dog-legged stair

A Lab report consisting designs (using software's /manually) & structural drawings (using AutoCAD / manually) on Designs shall be submitted by each student

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

A Lab Report based on above experiments shall be submitted by each student

PART II: Field Visit:

Field visit on any RCC framed structure under construction & submission of the report on site visit including copy of structural drawings and schedule of reinforcement collected from site.

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.

ESE: The End Semester Examination for Practical shall be based on the oral examination on design problems.

CEU607 GEOTECHNICAL ENGINEERING– LAB

Teaching Scheme: 02 P Total: 02 **Credits: 01**
Evaluation Scheme: ICA25 + ESE 25 **Total Marks: 50**
Duration of ESE: 3hrs.

PART I- Lab. Experiments: Any seven laboratory experiments from the following:

1. Determination of water content of a given soil sample/soil samples collected from fields.

2. Determination of specific gravity of given soil sample/soil samples collected from fields.
3. Determination of plasticity index of given soil sample/soil samples collected from fields.
4. Determination of in-situ dry unit weight of soil
5. Determination of MDD & OMC of a given soil sample
6. Determination of coefficient of permeability of given soil samples by constant head / falling head permeability tests.
7. Determination of shear strength of given cohesive soil samples.
8. Determination of shear strength of given non-cohesive soil samples.

PART II: Any two from the following

1. To classify given soil samples by visual inspection.
2. Determination of characteristics of a black cotton soil.
3. Classify given coarse grained soil / fine grained soil samples as per IS Code

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

A Lab Report based on above experiments shall be submitted by each student

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.

ESE: The End Semester Examination for Practical shall be based on the performance in any one lab. experiment followed by sample questions.

CEU608 – WATER RESOURCES ENGINEERING - LAB

Teaching Scheme: 02 P   Total: 02   Credits : 01
Evaluation Scheme: ICA 25 + ESE 00   Total Marks: 25

PART 1: Design & Drawing of Irrigation Structures:

1. Fixing control levels of Reservoir
2. Design and Stability analysis of Gravity dam
3. Design & Stability analysis of an Earth Dam
4. Design of a spillway and stilling Basin.
5. Design of canals
6. Drawing of cross drainage works

Data for the design and drawing may be obtained from the Water Recourses Department for the existing or proposed Project.

PART II: Field Visit

Afield visit to the construction site of earthen/Gravity dam, canal and canal structures shall be arranged. A report based on field visit consisting of copies of drawings collected from the field and salient features of the Project shall be submitted by each student.

A Lab Report based on above experiments shall be submitted by each student

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.

CEU609 ESTIMATING AND COSTING - LAB

Teaching Scheme: P - 02 Total: 02 Credits : 01
Evaluation Scheme: ICA 25 + ESE 00 Total Marks: 25
Duration of ESE: 3hrs.

PART I:

1. Drafting of Detailed Specifications for any SIX items of construction.
2. Detailed estimate of a single storied building with minimum four rooms with flat roof (Given problem).
3. Detailed estimate of any one type of bituminous road of minimum 1 km length including earthwork, sub-base and base course.
4. Detailed estimate of any two of the following: a) Septic tank for a colony b) R.C.C framed structure residential building c) Culvert.
5. Analysis of Rates for SIX items.
6. Problem of valuation of existing residential building.

PART II:

1. Study of Qe-Pro software/ Bentlay Software and preparation of detailed estimate of building using the software

PART III:

1. Preparation of Tender & Tender documents.

A Lab Report based on above experiments shall be submitted by each student

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.

ESE: The End Semester Examination for Practical shall be based on the oral examination on term work.

CEU610 – MINOR PROJECT

Teaching Scheme: P - 02 Total: 02 **Credits : 02**
Evaluation Scheme: ICA 25 + ESE 25 **Total Marks: 50**
Duration of ESE: 3hrs.

Any one of the following group project (A or B) may be selected

A. Students should conduct a detailed survey for five to seven days period in a survey camp at a suitable site for a civil Engineering Project for Data collection & analysis, related Design and submit the report and related drawings based on the any of the following project:

i. **Irrigation Project**: Tank basin survey, contour map, area-capacity curve.
ii. **Irrigation Project:** Collection of data for Minor Irrigation scheme such as Bandhara scheme, design of scheme and preparation of drawings
iii. **Water Supply Project**: Data collection for water requirement, selection of source, design of intake fixing alignment of rising main and profile leveling, design of rising main, selection of site for treatment plant, block contouring for treatment plant, fixing alignment of pure water rising main and profile leveling, fixing the location of ESR and block contouring of the site, survey for distribution network, design of distribution of network
iv. **Sewerage system project**: Data collection for sewage quantity, fixing alignment of sewers and profile leveling, design of sewers, selection of site for sewage treatment plant, block contouring for treatment plant, preliminary design
v. **Bridge Project:** Hydrological Data collection for project, fixing the location of bridge, River survey at bridge site, preliminary design of bridge.
vi. **Road Project:** Road project of 1 km length including contouring, fixing alignment, design of curves, road geometric design, estimating quantity and cost of project.

B. Public/Society related problem such as Water supply Problem, Irrigation Management problem, Problems related to construction of defective roads and their poor maintenance etc.
The problem should be identified with the help of parent Department such as Water Recourses Department, Jivan Pradhikaran, Public Works Department etc and Project may be taken up to provide the solution to the same with the help of Industrial expert from the parent Department.

A Lab Report based on above experiments shall be submitted by each student

Note:
ICA: The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A and B.
ESE: The End Semester Examination for Practical shall be based on the oral examination on term work.

CEU611 – SELF STUDY - II

Teaching Scheme: 00L + 00 T Total 00 **Credits: 02**
Evaluation Scheme: 25 ICA + 00 ESE **Total Marks: 25**
Duration of ESE: 3hrs.

Self study-II is based on one class test each, on the basis of 20% curriculum of the courses **CEU601, CEU602,CEU603 and CEU604** to be declared by respective course coordinator at the beginning of the semester. These class tests should be conducted separately for each course and after CT2. The marks of all such class tests then shall be converted to out of 25. One faculty member shall be appointed as course coordinator for Self Study I and his/ her teaching work load shall be considered as one hr/week.

CEU612 – INDUSTRIAL LECTURE-I*

Teaching Scheme: 01L + 00 T Total: 00
Credits: 00 (* Credits shall be awarded on the basis of combined assessment of CEU612 and CEU710.)
Evaluation Scheme: 00 ICA + 00 ESE Total Marks: 00
Duration of ESE: 00hrs.

Minimum twelve Industrial lectures shall be arranged, preferably once a week, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors such as Public works Department, Water Recourses Department, Jivan Pradhikaran, etc. and covering the various aspects of Project planning, Design, Construction materials, Field construction techniques, Construction Management, Material Testing, Recent advances in the field of Civil engineering etc. Topics of Industrial Lectures shall be general in nature and should not be the specific contents from the curriculum.

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CURRICULUM
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Department of Civil Engineering
2011-12

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Department of Civil Engineering.

B. Tech. (Civil Engineering)

SEM III

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
SHU301	Engineering Mathematics-III	3	--	---	3	10	15	15	60	---	---	100	3
CEU301	Engineering Geology & Hydrology	3	---	---	3	10	15	15	60	---	---	100	3
CEU302	Fluid Mechanics	3	1	---	4	10	15	15	60	---	---	100	4
CEU303	Strength of Materials	3	1	---	4	10	15	15	60	---	---	100	4
CEU304	Building Construction & Materials	3	---	---	3	10	15	15	60	---	---	100	3
SHU305	General Proficiency II	1	---	2	3	---	---	---	---	25	25	50	2
CEU305	Engineering Geology & Hydrology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU306	Fluid Mechanics Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU307	Strength of Materials Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU308	Building Construction & Materials Lab	---	---	2	2	---	---	---	---	25	25	50	1
	Total	**16**	**2**	**10**	**28**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**23**

TA :Teacher Assessment **CT: Class Tests** **ESE: End Semester Examination** **ICA : Internal Contineous Accessment**

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min.

SEM IV

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU401	Engineering Economics & Humanities	3	--	---	3	10	15	15	60	---	---	100	3
CEU402	Transportation Engineering	3	1	---	4	10	15	15	60	---	---	100	4
CEU403	Surveying	3	1	---	4	10	15	15	60	---	---	100	4
CEU404	Concrete Technology	3	---	---	3	10	15	15	60	---	---	100	3
CEU405	Open Channel Flow & Hydraulic Machines	3	1	---	4	10	15	15	60	---	---	100	4
CEU406	Transportation Engineering Lab	---	---	2	2					25	25	50	1
CEU407	Surveying Lab	---	---	4	4	---	---	---	---	50	50	100	2
CEU408	Concrete Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU409	Open Channel Flow & Hydraulic Machines Lab	---	---	2	2	---	---	---	---	25	25	50	1
	Total	**15**	**3**	**10**	**28**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**23**

TA :Teacher Assessment **CT: Class Tests** **ESE: End Semester Examination** **ICA : Internal Contineous Accessment**

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min.

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SEM V

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU501	Theory of Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU502	Design of Steel Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU503	Building Design & Drawing	2	---	---	2	10	15	15	60	---	---	100	2
CEU504	Advanced Surveying	3	1	---	4	10	15	15	60	---	---	100	4
CEU505	Water Treatment Process & Technology	3	---	---	3	10	15	15	60	---	---	100	3
CEU506	Design of Steel Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU507	Building Design & Drawing Lab	---	---	4	4	---	---	---	---	50	25	75	2
CEU508	Advanced Surveying Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU509	Water Treatment Process & Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU510	Self Study-I	---	---	----	--	---	---	---	---	25	---	25	1
Total		**14**	**3**	**10**	**27**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CEU502 and CEU503 for which the ESE duration will be 3 hrs.

Self study-I is based on one class test each, on the basis of 20% curriculum of the courses CEU501, CEU503, CEU504 and CEU505 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study I and his/ her teaching work load shall be considered as one hr/week.

SEM VI

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU601	Design of Reinforced Concrete Structures	3	--	---	3	10	15	15	60	---	---	100	3
CEU602	Geotechnical Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU603	Water Resources Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU604	Construction Management	3	---	---	3	10	15	15	60	---	---	100	3
CEU605	Estimating & Costing	3	---	---	3	10	15	15	60	---	---	100	3
CEU606	Design of Reinforced Concrete Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU607	Geotechnical Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU608	Water Resource Engineering Lab	---	---	2	2	---	---	---	---	25	-	25	1
CEU609	Estimating & Costing Lab	---	---	2	2	---	---	---	---	25	-	25	1
CEU610	Minor Project	----	----	2	2	---	----	---	----	25	25	50	2
CEU611	Self Study-II	---	---	----	--	---	---	---	---	25	---	25	1
CEU612	Industrial Lecture-I*	1	---	----	1	---	---	---	---	---	---	---	---
CEU613	Seminar	---	---	2	2	---	---	---	---	25	-	25	1
Total		**16**	**0**	**12**	**28**	**50**	**75**	**75**	**300**	**175**	**75**	**750**	**23**

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CEU601 and CEU605 for which the ESE duration will be 3 hrs.

*** Credits shall be awarded on the basis of combined assesment of CEU612 and CEU710.**

Self study-II is based on one class test each, on the basis of 20% curriculum of the courses CEU601, CEU602,CEU603 and CEU604 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study II and his/ her teaching work load shall be considered as one hr/week.

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SEM VII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU701	Advanced Theory of Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU702	Foundation Engineering	3	1	---	4	10	15	15	60	---	---	100	4
CEU703	Elective-I	3	---	---	3	10	15	15	60	---	---	100	3
CEU704	Interdisciplinary Elective	3	---	---	3	10	15	15	60	---	---	100	3
CEU705	Advanced Theory of Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU706	Foundation Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU707	Software in Civil Engg Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU708	Project-Phase-I	---	---	4	4	---	---	---	---	100	--	100	2
CEU709	Industrial Visit / Training	---	---	---	--	---	---	---	---	50	---	50	2
CEU710	Industrial Lecture-II*	1	---		1	---	---	---	---	25	---	25	1
CEU711	Self Study-III	---	---	---	--	---	---	---	---	25	---	25	1
Total		13	2	10	25	40	60	60	240	275	75	750	23

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CE U701 for which the ESE duration will be 3 hrs.

Students of this department shall select any one Interdisciplinary Elective offered by other department. Interdisciplinary Elective shown below will be offered to students of other department.

*** Credits shall be awarded on the basis of combined assesment of CEU612 and CEU710.**

Self study-III is based on one class test each, on the basis of 20% curriculum of the courses CEU701, CEU702 and CEU703 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study III and his/ her teaching work load shall be considered as one hr/week.

SEM VIII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
CEU801	Advanced Structural Design	3			3	10	15	15	60			100	3
CEU802	Environmental Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU803	Elective -II	3	---	---	3	10	15	15	60	---	---	100	3
CEU804	Elective -III	3	---	---	3	10	15	15	60	---	---	100	3
CEU805	Advanced Structural Design Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU806	Environmental Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU807	Elective -II Lab	---	---	2	2	---	---	---	---	25	---	25	1
CEU808	Elective -III Lab	---	---	2	2	---	---	---	---	25	---	25	1
CEU809	Project	---	---	6	6	---	---	---	---	75	100	175	6
CEU810	Self Study-IV	---	---	---	--	---	---	---	---	25	----	25	1
Total		12	0	14	26	40	60	60	240	200	150	750	23

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CE U801 for which the ESE duration will be 3 hrs.

Self study-IV is based on one class test each, on the basis of 20% curriculum of the courses CEU801, CEU802 CEU803 and CEU804 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study IV and his/ her teaching work load shall be considered as one hr/week.

Electives

CEU703 Elective-I	CEU704 Interdisciplinary Elective	CEU803 Elective-II	CEU804 Elective-III
A) Advanced Structural Analysis	A) Optimization and Modelling	A) Structural Dynamics	A) Hydraulic Structures
B) Advanced Soil Mechanics	B) Industrial Building Planning & Design	B) Earthquake Resistant Design	B) Advanced Design of Steel Structure
C) Matrix Analysis of Structures	C) Interior Designs & Drawing	C) Pavement Design & Construction	C) Finite Element Method
D) Environmental Pollution & Soild Waste Management	D) Project Management	D) Advanced Wastewater Treatment	D) Ground Improvement Technology
E) Railways, Tunnels & Airport Engineering		E) Advanced Foundation Engineering	E) Remote Sensing & GIS
F) Advanced Fluid Mechanics		F) Advanced Construction Management	F) Advanced Water Treatment Process & Technology

SHU301 ENGINEERING MATHEMATICS-III

Teaching Scheme 03 L + 00 T   Total 03   Credit: 03

Marking scheme: 15CT1 + 15CT2 + 10TA + 60 ESE   Total Marks: 100

Duration of ESE: 2Hrs.30min

Linear Differential Equations with constant coefficients:

General solution to L.D.E. of n^{th} order with constant coefficients, rules for finding C.F., General method for finding P.I., P.I. of some standard functions, Method of Variation of Parameters, Cauchy's and Legendre's L.D.E., applications of L. D. E. to deflection of beam, bending moments.

Partial Differential Equations:

Complete solution of PDE, Linear and non-linear PDE of types (i) f(p, q)= 0, (ii)f(p, q, z)= 0, (iii)f(p, q, x, y)= 0,(iv)f(p, q, x, y, z)= 0 i.e. Lagrange's form Pp+Qq=R and Clairaut's form z = px + qy + f(p, q), (v) Equations reducible to above forms. Complete solution of PDE of first and second order by method of separation of variables.

Laplace Transform:

Definition, standard formulae and properties of LT., Inverse Laplace Transform, Convolution Property.

Numerical Methods:

Solution of system of linear equations by Crout's method, Gauss Siedal method.

Numerical solution of ordinary differential equations: Taylor's series method, Modified Euler's method, Runge Kutta method.

Statistics:

Correlation: coefficient of Correlation, lines of regression, Curve fitting by least square method. Probability distribution: Binomial, Poisson and Normal.

Text Books:

1. Text Book of Applied Mathematics, P. N. Wartikar and J.N.Wartikar, Pune Vidyarthi Griha, Pune, 2001.
2. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, 40th edition, New Delhi, 2007.

Reference Books:

1. Advanced Engineering Mathematics, Kreyzig, John Wiley & Sons, 9th edition, 1995.
2. Advanced Engineering Mathematics, John Bird, 5th edition, Elsevier Publication 2007.
3. Higher Engineering Mathematics, C. R. Wiley, 8th edition, John Wiley and Sons, 1999.

CEU301 ENGINEERING GEOLOGY AND HYDROLOGY

Teaching scheme: 03 L + 00 T   Total 03   Credit: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 2hrs.30 min.

ENGINEERING GEOLOGY

Different branches of Geology and importance of geology in Civil Engineering.

Mineralogy: Study of common rock forming and ore minerals with reference to its physical properties.

Petrology: Rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Structural Geology: Outcrop; dip strike, elementary ideas about folds, joints, faults and unconformity, effect of these structures in foundation.

Earthquakes engineering: Earthquake waves, causes and effects, magnitudes and intensity, earthquake zones of India, seismic coefficient.

Geological Investigation: Surface and sub-surface investigation, direct and indirect. Rock as a material of construction, Study of engineering properties of rocks and soils. Geological studies related to site selection for dam and reservoirs, tunnel alignment, bridges, roads, etc. Case histories of some major projects of tunnels, dams and reservoirs.

HYDROLOGY

Introduction: Definition and its importance, hydrological, cycle, Hydrologic equation.

Precipitation: Forms, Types, factor affecting, measurement, rain gauge network, estimation of missing data, consistency of data, mean area precipitation, artificial rain.

Evaporation: Process, factor affecting, measurement and estimation, control of evaporation.

Evapo-transpiration: factor affecting, measurement and estimation

Infiltration: Process, factor affecting, measurement, infiltration indices

Run off: Factor affecting, estimation of runoff, rainfall- runoff correlation

Flood: Flood classification, importance, estimation of flood, flood control techniques,

brief description of flood Routing. Channel flow routing.

Hydrographs: Typical flood control hydrograph, base flow separation, depression storage, overland flow, unit hydrograph, s-curve hydrograph, Synthetic unit hydrograph.

Ground Water: Ground and surface water resources, aquifer parameters, specific yield and specific capacity, artificial ground water recharging.

Text Books:

1. General and Engineering Geology, Parbin Singh, 6th edition, Kataria S. K. Sons, 2001.
2. Hydrology, Subramanyam K, 2nd edition, Tata McGraw Hill, 2003.

Reference Books:

1. Water Resources Systems Planning and Management, Chaturvedi M. C., Tata McGraw Hill,1987
2. Geology of India, , Wadia D.N. , 4^{th} edition Tata McGraw Hill, , New Delhi, 1978.
3. A Text Book of Geology, Mukharjee 4th edition, The World Press Private Ltd, Calcutta, 2005.
4. Handbook of Hydrology, Chow, Y. T., McGraw Hill, 1988
5. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14^{th} edition, Standard Book House, New Delhi, 2009

CEU302- FLUID MECHANICS

Teaching scheme: 03 L + 01 T Total 04 Credit: 04

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100

Duration of ESE: 2hrs.30 min.

Introduction: Fluid & Fluid Mechanics, Applications in Civil Engineering, Physical properties of fluids-mass density, unit weight, specific gravity, compressibility, bulk modulus, surface tension, viscosity, Newton's law of viscosity, Dynamic and kinematic viscosity, classification of fluids

Fluid Statics: Hydrostatic law, pressure at a point, Pascal's law, Pressure head, Atmospheric pressure, Absolute and gauge pressure, total pressure and center of pressure, Pressure diagram, Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves.

Buoyancy and Floatation: Introduction, Buoyant force and center of buoyancy, Archimedes Principle, Principle of floatation, Metacenter and metacentric height, Equilibrium of floating bodies.

Fluid kinematics: Types of flow-steady & unsteady, uniform & non-uniform, laminar & turbulent, one, two & three dimensional, rotational & irrotational, compressible and incompressible, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluid flow

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation, assumption and limitations, different forms of energy heads, loss of head, Modified form of Bernoulli's theorem, Energy gradient line and Hydraulic gradient line, Impulse momentum equation.

Flow through pipes: Major losses and minor losses, Darcy Weisbach equation, Factor affecting friction factor, Coefficient of friction for commercial pipes, Moody's diagram, Flow through simple pipes, Flow through pipes in series, Flow through pipes in parallel, siphons pipes, Equivalent pipes, Water hammer in pipes-causes, effects & remedial measures, Transmission of power through pipe flow

Flow measurements: Velocity measurements: Pitot tube- basic principle of working, types, **Discharge measurement for pipes:** Venturimeter-principle, equation for discharge, orifice plate meter **Discharge measurement for tanks:** Orifice-types, flow through circular sharp crested orifice, hydraulic coefficient

Laminar flow: Relation between shear stress and pressure gradient, Steady laminar flow through circular pipes, Hagen-Poiseuille law (no derivation), Laminar flow between parallel plates

Flow around immersed objects: Practical problems involving flow around immersed objects, Drag and lift-definition & expression, Types of drag, Pressure drag on flat plate, Stream line & bluff bodies.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009
2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, 9th edition Standard Publishers Distributors, New Delhi, 2009.

Reference Books:

1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008
2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.
3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011
4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd, 1997.

CEU303-STRENGTH OF MATERIALS

Teaching Scheme: 03 L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Mechanical properties: Concept of direct, bearing and shear stresses and strains, stress strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, TOR steel and concrete,

Generalized Hook's law, factor of safety.

Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Stresses in beams (Bending, Shear):

i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.

ii) Shear: Distribution of shear stresses on beam cross sections,

iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft

Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.

Thin and Thick cylinders and thin spherical shells subjected to internal pressures.

Combined direct & bending stresses: Combined direct and bending stresses, applications to short columns with eccentric loads.

Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macaulay's method, Moment Area method and Conjugate Beam method.

Columns: Theory of long columns, Euler, Rankin formula

Introduction to fatigue

Text Books:

1. Engineering Mechanics of Solids, E.P. Popov, 2nd edition, Prentice Hall of India, 1998
2. Mechanics of Materials, Beer, Johnston and DeWolf, 3rd edition, Tata McGraw Hill Publication, New Delhi, 2002.

Reference Books:

1. Mechanics of Materials, Gere and Timoshenko, 2nd edition, CBS publishers, 2002.
2. Mechanical of Solids in Introduction, Laudner T. J. and Archer R. R., McGrawHill International edition, 1994.
3. Theory and Problems of Strength of Materials, William A. Nash, 3rd edition, Schaum's Outline Series, McGraw Hill International editions, 1994.

CEU304 BUILDING CONSTRUCTION & MATERIALS

Teaching scheme: 03 L + 00 T   Total 03   Credit: 03

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   Total Marks: 100

Duration of ESE: 2hrs. 30 min.

Introduction: Types of building as per National Building Code, Components of buildings and their functions, Types of structures-load bearing, framed and composite structures, their suitability, relative advantages and disadvantages

Foundation: Definition, purpose, Loads acting on foundation, Safe bearing capacity of soil-definition, values from IS code, Types of shallow foundation for buildings-spread footings for walls and columns, combined footing for columns, raft foundation, Setting out for foundation

Floors & Floor finishes: Floors- Definition & purpose, Types of R.C.C. floors-R.C.C. slab floor, R.C.C. slab & beam floor, Ribbed floor, Flat Slab, their suitability and construction procedure, Flooring tiles: Types-plain cement tiles, Mosaic tiles, chequred tiles, ceramic tiles, glazed tiles, P.V.C. flooring tiles, Types of flooring-suitability and construction procedure.

Doors & Windows:

Wood & Wood based Products**:** Characteristics of good timber, Chief varieties of timber and their uses in construction, Market forms of timber and their uses in construction, Industrial timber products-veneer, Ply wood, particle board, fiber board, batten board, block board, pre-laminated boards, laminates.

Aluminum products: market forms, powder coating & anodizing of aluminum sections.

Doors-Purpose, Criteria for location, Sizes, Types of door frames, Methods of fixing door frames, Types of door shutters- fully paneled, flush, louvered, glazed, sliding, revolving, rolling shutter, collapsible door, grilled door, suitability of different types of doors. Types of aluminum doors

Windows-Purpose, Criteria for location, Sizes, Types of wooden windows-casement, louvered, glazed, metal windows, Aluminum windows, Corner & bay windows, Ventilators-purpose and types, Grills for windows

Fixtures and fastenings of doors and windows**:** Hinges-types and uses, Bolts-types and uses, Handles and locks

Lintels and Arches: Lintels-purpose, types and their suitability, details of R.C.C. lintel, Arches- purpose, types and their suitability

Stairs: Function, Technical terms, Criteria for location, Requirements of good stair, Types of stairs and their suitability, Design of stair, Lifts types and their suitability, Ramps, Escalators

Roofs: Flat & pitched roofs-suitability, Types of steel roof trusses and their suitability, Placing and fixing trusses, Types of roofing sheets, Fixing of roofing sheets to trusses

Use of Coal ash: Coal ash production, types, properties, use in concrete, cement, bricks, embankments etc.

Masonry construction:

Brick Masonry: Qualities of good bricks, Field and laboratory tests on bricks, Classification of bricks, Mortars**:** Types of mortars and their suitability, Proportion of mortars used for different works Technical terms in brick masonry, Principles to be observed during construction, Header bond, Stretcher bond, English Bond, Flemish bond (1 & 11/2 brick thick walls), Construction procedure, defects in brick masonry, Strength of brick masonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction procedure

Concrete block masonry: Types-solid and hollow, common dimensions, Construction procedure

Plastering and pointing: Purpose, Types and their suitability, Procedure of plastering and pointing, Defects in plastering work

Coloring & painting:

Paints Enamels and varnishes: Types Procedure of painting old and new masonry surfaces, metal surfaces and wooden surfaces

Damp proofing: Causes and effects, Methods of damp proofing, materials required, Water proofing compounds- suitability and uses, Details of cavity wall construction

Joints in structure: Construction joints-necessity, provision of construction joint in slab, beam and columns, Expansion joints –necessity, location, materials used, details of expansion joints at foundation and roof level for a load bearing and framed structure.

Formwork & scaffolding: Form work-types and suitability, Period for removal of formwork, Scaffolding**:** Necessity, Types, Details of erections

Text Books:

1. Building Construction, Sushil Kumar, 19th edition, Standard Publishers Distributors, New Delhi, 2008
2. Building Materials, P.C. Verghese, 1st edition, Prentice-Hall of India, New Delhi, 2009.

Reference Books:

1. National Building Code of India 2005, B.I.S., 2nd revision, Techniz Books International, New Delhi, 2005.
2. NFPA 5000: Building Construction & Safety Code, NFPA, Techniz Books International, New Delhi, 2009
3. Building Materials & Components for Developing Countries, C.B.R.I., Tata Mc-Graw Hill Publishing Co. New Delhi, 1990.
4. Building Construction, Gurucharan Singh, 11th Edition, Standard Book House, New Delhi, 2010.

SHU305 GENERAL PROFICIENCY – II

Teaching Scheme: 01L + 02 P   Total : 03   Credit : 02
Evaluation Scheme: 25 ICA + 25 ESE   Total Marks: 50

Duration of ESE: 3Hrs.

Presentation Skill:

Communication boosters – aura words, pronunciation, body language – voice, posture and gesture, eye contact, dress codes.

Function of culture code in presentation – planning, preparing and delivering a presentation, etiquettes, clarity and aliveness of delivery.

General communication skill for presentation – content matching and language matching for specific audience, tone, hummer poise- listener/speaker sensitivity.

Specific communication skill for presentation – icebreaker, small talk dialogue, debate, turn taking, effective and defensive handling of question.

Models of presentation – Public speaking, academic and professional presentation, group discussion, personal interview, technical report writing (IEEE standards).

Managerial skill:

Time management - advantages, time wasters – procrastination, time management tips and strategies.

Stress management- stress and its disadvantages, stress coping ability and stress inoculation training, management of various types of fear, depression and anger.

Conflict management -types of conflict, conflict stimulation and conflict resolution technique for conflict for effective conflict management, effective ways of dealing with people, significance of body language in communication and assertiveness training.
Interpersonal skills -concept of team, advantages of teamwork, promotion of team spirit, team building techniques, nurturing leadership qualities, negotiation skills.

Topics for assignments/practicals:
Minimum eight assignments/practicals based on above topics. The representative list is given below

1. Collection of new words concerning various technical and professional subjects
2. Listening of audiocassette or lecture or watching videocassette (based on the topics of managerial skill) followed by speech/seminar by students.
3. Listening of audiocassette or lecture or watching videocassette (based on the topics of managerial skill) followed by group discussion of students.
4. Collecting the information related to the topics of managerial skill using Internet, books, Magazines etc. and its power point presentation or seminar/lecture.
5. Power point presentation on topic related to any subject of programme.
6. Preparing a technical paper in IEEE format.
7. Management games.
8. Personal interview.
9. Extempore elocution, debate.

Text Books:

1. Professional Communication Skills, Alok Jain, Pravin S. ,R. Bhatia, A. M. Sheikh, 3^{rd} edition, S. Chand and Company, New Delhi, 2005
2. Personality Development, E. B. Hurlock, 5^{th} edition, Tata MacGraw Hill, New Delhi, 2006

Reference Books:

1. Power of Positive Thinking, D. J. Mile, 1^{st} edition, 28^{th} reprint , Rohan Book Company, Delhi, 2004
2. All About Self motivation, Pravesh Kumar, 3^{rd} edition, Goodwill Publishing House, New Delhi, 2005
3. Body Language: How to Read Others Thoughts by their Gestures, Pease, Allan, 3^{rd} edition, Sudha Publications, New Delhi, 1998.
4. Multiple Intelligences: The Theory in Practice: A Reader, Gardner, Howard,1^{s} edition, Basic Books. New York, 1993.
5. Six Thinking Hats, De Bono, Edward, 2^{nd} edition, Penguin Books, New York, 2000

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU305 ENGINEERING GEOLOGY & HYDROLOGY LAB

Teaching scheme: 02P **Total 02** **Credit : 1**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE: 3Hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU301) from the list or otherwise.

ENGINEERING GEOLOGY

1. Megascopic study of common rock forming and ore minerals.
2. Megascopic study of the common igneous, sedimentary and metamorphic rocks.
3. Geological map reading and construction of selections from simple geological Maps with engineering problems (about 8 maps)
4. Field visit to rock / soil strata exposure, fault zone, fractures, drilling rigs or machine work.

HYDROLOGY

1. Determining the inflow at the reservoir using hydrograph.
2. Field visit shall be arrange at dam site to understand the functions and performance for the following aspects,
    a. Rain gauge stations
    b. Humidity measurements
    c. Temperature measurements

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU306 FLUID MECHANICS LAB

Teaching scheme: 02 P **Total 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE: 3Hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU302) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Identification of laminar and turbulent flow by conducting Reynolds experiment.
2. Identification of type of equilibrium of given floating body analytically and experimentally.
3. Drawing EGL & HGL for given flow through pipes using experimental setup.
4. Calibration of Venturimeter / Orifice plate meter.

5. Determination of hydraulic coefficients of orifice.
6. Determination of friction factor/coefficient of friction for pipes of different diameter/materials.
7. Determination of minor losses in pipes fittings (Elbow / bends / valves / reducers / taper).
8. Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves from the given data.
9. Drawing the HGL & EGL for flow through compound pipeline on graph paper from given data.
10. Measurement of flow, pressure, velocity of fluid using digital instruments.

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU307 STRENGTH OF MATERIALS LAB

Teaching Scheme: 02 P **Total = 02** **Credit: 1**

Evaluation Scheme: Internal = 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE: 3Hrs.

It is a representative list of practical. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU303) from the list or otherwise. Minimum eight experiments should be performed from part A, while part B is compulsory.

List of Practicals:

Part A:

1. To perform tension test on mild steel and compare the results obtained with standard IS values and comment
2. To perform tension test on TOR steel also perform bend test. Compare the results obtained with standard IS values and comment. Refer I.S. 1608.
3. To perform compression test on metals. Observe the nature of failure and determine the compressive stress. Refer I.S.1708 for test procedure.
4. To perform compression test on Wood (parallel and perpendicular to grains). Observe the nature of failure and determine the compressive stress. Refer I.S.1708 for test procedure. Comment on results.
5. To perform shear test on metals. Study single & double shear action. Interpret failure pattern and calculate shear strength in single & double shear. Refer I.S 5242-9779.

6. To perform impact test on metals. Determine the shock absorbing capacity of the material using Izod impact test apparatus. Compare the impact resisting qualities of different metals. Refer IS: 1598 and IS: 1757 – 1973.
7. To perform hardness test on different metals and compare hardness number for different metals. Refer IS 1500.
8. To perform torsion test on metals. Interpret the graph of torque and angle of twist and determine shear strength and modulus of rigidity of the specimen. Refer I.S. 1717.
9. To find deflection of beams, bending stresses and their relation for simply supported beam. Also find Young's modulus.
10. Determine modulus of rupture of wooden beam. Observe the parameters that affect modulus of rupture.
11. Observe types of columns, their deflection behaviors. Understand buckling of columns and factors affecting strength of columns. Find buckling load of given set of columns with different end conditions.
12. Observe deflection and working of different types of springs. Determine modulus of rigidity of spring material and stiffness of spring.

Part B: At least four problems from four different topics to be solved using either programming or spreadsheet or solvers or any software.

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU308 BUILDING CONSTRUCTION & MATERIALS LAB

Teaching scheme: 02 P **Total 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE: 3Hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU304) from the list or otherwise.

List of Practicals:

1 Drawing free-hand sketches in the Sketch book of following building components

i. Different types of foundations

ii. Different types of R.C.C. Floors

iii. Line diagrams of different types of steel roof trusses

iv. Different types of stairs (plan and elevations)

v. Types of bonds in brick masonry –plan and elevation of stretcher & header bond, 1 brick thick wall in English and Flemish bond, brick columns

vi. Expansion joints at foundation and roof level in load bearing and framed structure

vii. Any one type of scaffolding (elevation and section)

viii. Form work for R.C.C. floor

ix. Section of typical load bearing and framed structure

2. Drawing of following building components on half imperial drawing sheet

i) Details of fully paneled/flush door and glazed window, indicating dimensions

ii) Design of dog-legged stair from given data and its drawing (plan and section)

iii) Details of steel roof truss along with roof covering and fixing at support

iv) Preparation of setting-out plan for foundation from given line plan of a two-room building

3 Setting out in field for foundation of building from the plan in sheet no. 4

4. Setting out in field layout of compound wall for plot having curved corner.

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU401 ENGINEERING ECONOMICS AND HUMANITIES

Teaching Scheme : 03 L + 00 T Total 03 Credit : 03

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE: 2hrs.30 min

ECONOMICS :

Introduction: Nature and Scope of Economics; Special significance of economics to engineers

Banking: Function of Central, Commercial Banks and Reserve Bank of India.
Taxation: Principal of taxation, Direct and Indirect taxes, concept of auditing
Market: Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly
Economics of Development: Meaning, Characteristics of under development, obstacles to economic growth and vicious circle of poverty, Theory of national income, concept of Gross Domestic Product and artificial intelligence in economics.

Economic planning: Meaning, objective and salient features of current five years plan of India Economics of comparison of different alternative projects.

HUMANITIES:

Salient features of Indian Constitution, Fundamental rights and Duties, Directive Principles of State Policy. Latest amendments in Indian constitution such as Right to information act, Right to Education- its definition, applicability and benefits.

Environmental laws, Indian Patent Laws, Labour Laws: definition, significance and application.

Impact of Science and Technology on Culture and Civilization; Social responsibility of business.

Human Society: Community Groups, Social Control: Meaning, Types and Agencies. Psychology: Definition, nature, scope, hurdles and application in industries.

Text Books:

1. Human Society, Davis K, Delhi Surjeet Publication, 2007.
2. Elementary Economic Theory, Dewett and Varma J. D, S. Chand & Co, New Delhi, 2011
3. Constitutional Govt. in India, Pylee M. V, S., 4th edition Chand & Co, New Delhi, 1984.

Reference Books:

1. The Constitution of India, Joshi G. N., 6th edition, MacMillan India Ltd, 1975.
2. Economics: An Introduction to its Basic Principles by Mitra, J. K., Word Press Pvt. Ltd.,1976
3. Managerial Economics: Concepts and cases, Mote, V. N, Samual Paul and G. S. Gupta, Tata McGraw Hill Co.Ltd. New Delhi, 1977.
4. Environmental Law, Stuart Bell, and Donald McGillivray. Oxford University Press. Inc. New York Seventh Edition, 2008.
5. Introduction to Indian Constitution, Durga Das Basu, Prentice-Hall of India, 1982.

CEU402 TRANSPORTATION ENGINEERING

Teaching scheme: 03 L + 01 T **Total 04** **Credit: 04**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs.30 min

INTRODUCTION

Importance of Transportation in Nation Development, Different modes of transportation and their relative advantages & disadvantages.

HIGHWAY ENGINEERING

Characteristics of Road Transport, Classification of Roads

Highway planning & engineering surveys: Necessity, Planning Surveys, Preparation of Plans, Master plan and its phasing, Highway alignment, Engineering surveys, Drawings and reports, Stages in new Highway Project.

Highway geometric design & IRC recommendations: Design controls and criteria, Highway cross sectional elements, Camber**,** Width of pavement or carriageway, Width of roadway or Formation width, Right of way, Sight distance, Superelevation, Widening of pavement on curves, Gradient, Vertical curves, Typical cross section of Highway in cutting and filling

Highway materials and testing: Stone aggregates properties and different tests, **Bituminous Materials –** Bitumen, Tests on bitumen, cutback bitumen, Bituminous emulsions, Tar, Bituminous paving mixes, Design of bituminous mixes – Marshall method

Design of highway pavement: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Rigid pavement, joints in rigid pavement

CONSTRUCTION OF HIGHWAY:

Construction of W.B.M. roads- specifications of materials, construction procedure

Construction of Bituminous pavements - Types of bituminous constructions, construction procedure for Surface Dressing, Penetration Macadam, Bituminous Macadam, Bituminous Concrete

Construction of Cement Concrete pavements - construction of pavement slab, construction of joints

Highway maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works, Maintenance of W.B.M. roads, Bituminous surfaces and cement concrete pavements, Strengthening of existing pavements.

Highway drainage: Importance, Surface drainage, Sub-surface drainage

BRIDGE ENGINEERING

Bridge Components and their functions, Abutments, piers and wing walls, bearing, approaches, foundation, Types and choice, Site selection.

Culverts & causeways- Types and selection

Types of major bridges based on various criteria, Suitability of different types.

Design flood discharge, Linear waterway, Scour depth, Afflux, Depth of foundation, Free board, Economic span, IRC recommendations, Data collection

Erection of bridge superstructure, Launching of Girders

TUNNEL ENGINEERING

Necessity, types, tunnel alignment

Tunneling methods in soft soils and hard rock, size and shape of tunnels, tunnel lining, drainage, ventilation and lighting of tunnel

Text Books:

1. Highway Engineering, Khanna S.K. & Justo C.E.G., Nem Chand & Bros., Roorkee, 11th edition, 2001
2. Elements of Bridges, Tunnels and Railways Engineering, Bindra, S. P., Dhanpat Rai & Sons, Delhi, 2010
3. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, Prentice Hall of India, 2009

Reference Books:

1. Transportation Engineering Vol. I & II, V.N. Vazirani & S.P. Chandola, 7th edition , Khanna Publishers, New Delhi, 2003.
2. Transportation Engineering: An Introduction, Khisty and Lall, 3rd edition, Prentice Hall, 2003.
3. Bridge Engineering, Ponnuswamy, S., 2nd edition, Tata McGraw Hill Publication, New Delhi, 2007.
4. Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 1st Edition, John Willey, 2008.
5. Principles of Highway Engineering & Traffic Analysis, Mannering F. L., Walter P. K. and Scott John, 3rd edition Willey, 2004.

CEU403 SURVEYING

Teaching scheme: 03 L + 01 T Total 04 Credit: 04

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100

Duration of ESE: 2hrs.30 min.

Introduction: Surveying- Necessity & purpose, Classification of survey, principles of surveying, Basic measurements in surveying, work of surveyor

Linear Measurements and offsets: Instruments for measurement of distance, linear measurements, errors in measurements, corrections to field measurements, Instruments for marking stations, ranging out, direct and indirect ranging, Chaining on sloping ground, Offsets-Types, Instruments for marking offsets, degree of accuracy of offsets, Instruments for setting right angle, obstacles in chaining & ranging, Cross staff survey

Chain & Compass surveying : Selection of survey stations, Survey lines, Bearing of a line, fore bearing, back bearing & reduced bearing, Prismatic compass – its use & adjustment, local attraction, magnetic declination & its variation, calculation of included angles from bearing.

Chain & compass traversing : Open & closed traverse, reconnaissance, fixing of stations, Booking field notes, Plotting of traverse survey, adjustment of traverse by Bowditch’s graphical method.

Plane table surveying : Introduction, use, advantages & disadvantages, accessories required, principle of plane table surveying, orientation of plane table, methods of orientation, methods of plane table surveying, two point & three point problem.

Leveling : Technical terms, principle of leveling, Bench mark & its types, Instruments used for leveling, Auto level, Digital level, Temporary adjustments, leveling staffs and its types, precautions in leveling, booking of field readings in field book, calculation of RL by using height of collimation method & rise & fall method. Arithmetic check, Classification of leveling-reciprocal, leveling difficulties, Errors and mistakes in leveling, correction for curvature & refraction.

Profile Leveling: Fixing alignment, L-section & Cross section, selection of scales & plotting, fixing formation level

Contouring: Definition, characteristics, contour interval, methods of locating contours, interpolation of contours, contour maps & its uses, contour drawing

Planimeter: Digital planimeter-components, setting, selection of scale, computation of area.

Theodolite: Component parts of transit Theodolite, fundamental lines temporary adjustment, measurement of horizontal angles by repetition & reiteration method, measurement of vertical angles, deflection angles, magnetic bearing, lining in by Theodolite, balancing in by Theodolite, prolonging a straight line, laying off horizontal angle, use of Theodolite as a level.

Total station: Introduction, components, adjustments, various uses.

Text Books

1. Surveying Part-I, T.P. Kanetkar and S.V. Kulkarni, 24th edition, Pune Vidyarthi Griha Prakashan, Pune, 2002.
2. Surveying, Punmia B.C. and Jain A.K., 16th edition, Laxmi Publication, Delhi, 2005.

Reference Books

1. Surveying Principles and Applications, Kavanagh, 7th edition, Prentice Hall, 2007.
2. Surveying Fundamentals & Practices, Nathanson, Lanzafama and Kissam, 5th edition, Prentice Hall, 2006.
3. Surveying Vol. I, S.K. Duggal, 2nd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2005.

CEU404 CONCRETE TECHNOLOGY

Teaching Scheme : 03 L + 00 T Total = 03 **Credits: 03**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs.30 min.

Cement: Various types of cement, Chemical Composition of Portland Cement, Manufacture of Portland Cement, Properties of Cement, Laboratory Tests.

Aggregate: Classification of Aggregate, Physical Properties, Bulking and Moisture Content, Specific Gravity, Bulk Density, Laboratory Tests, replacement of sand by crushed aggregate

Water: Impurities in Water and Their Effects on Properties of Concrete.

Admixtures: Various Types of Admixtures and Their Functions.

Proportioning of Concrete Mixes: Introduction of Mix Design, Basic Consideration in Concrete Mix Design, Factors Influencing the Choice of Mix Proportions, Methods of Concrete Mix Design with special emphasis on IS Code Method And IRC-44 Method.

Production of Concrete: Batching of Materials, Mixing, Transportation and Placing of Concrete, Compaction of Concrete, Curing of Concrete.

Properties of Fresh Concrete: Workability of Concrete, Factor Affecting Workability, Measurement of Workability.

Properties of Hardened Concrete: Strength of Concrete, Stress-Strain Characteristics, Shrinkage and Temperature Effect, Creep, Permeability and

Durability of Concrete. Inspection, Testing And Quality Control of Concrete: Inspection, Testing of fresh Concrete, Factors causing Variation in Quality of Concrete, Field Control, Advantages of Quality Control, Testing of Hardened Concrete using NDT Method.

Special Concretes and Concreting Techniques: Light Weight Concrete, Fiber-Reinforced Concrete, Roller Compacted Concrete, High Strength Concrete, Vacuum Concrete, Ferro Cement.

Guniting, Grouting and Shotcreting Concrete.

Text Books:

1. Concrete Technology, Neville A. M. and Brooks J. J., 1st edition, Prentice Hall, 1987
2. Concrete Technology, Gambhir M L, 3rd Edition, Tata McGraw Hill, New Delhi, 2008.

Reference Books:

1. Lea's Chemistry of Cement and Concrete, Lea F M, Edward, Elsevier, 2003.
2. Properties of Concrete, Neville A M, 4th edition, Pearson, 1995.
3. Concrete, Mindess Sidney, Young J. Francis and Darwin David, 2nd edition, Prentice Hall, 2002.
4. Design of Concrete Mixes, Krishna Raju, 4th edition, CBS Publishers, 2000

CEU405 OPEN CHANNEL FLOW & HYDRAULIC MACHINES

Teaching scheme: 03 L + 01 T **Total 04** **Credit: 04**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs.30 min.

Uniform Flow through channel: Types of channels, Geometrical properties of prismatic channel section, types of flow through channel, Characteristics of uniform flow through prismatic channel, Chezys equation, Mannings equation, Mannings constant for different types of channel surfaces, Economical channel section, Conditions for rectangular & trapezoidal economical channel section, Specific energy of flow, Specific force and specific discharge, specific energy diagram, critical depth, criteria for critical depth, subcritical, critical and supercritical flow, Froud No.

Velocity measurements: Current meter-types and working, Floats-types

Discharge measurement for channels: Notches-Types, Discharge over rectangular notch, triangular notch, trapezoidal notch, Cippolletti notch, End contraction and velocity of approach, Francis formula, Weirs- discharge over broad crested weir, Flumes- Venturiflume -working principle and computation of discharge, River gauging by segment method

Non-uniform flow through channel: Types of non-uniform flow, Gradually varied flow (GVF) and rapidly varied flow (RVF), Equation of GVF and its alternative solutions, Classification of channel bed slopes, Various GVF profiles, their characteristics and field examples, Rapidly varied flow, Hydraulic jump- definition, location, practical examples of its occurrence, Analysis of hydraulic jump in rectangular channel-relation between conjugate depths, energy dissipation, Classification of jumps, Practical applications of hydraulic jump, Energy dissipation below ogee spillway

Model investigations: Model study-similitude, Types of similarities, Types of forces acting on structures, Force ratios, Non-dimensional numbers and their significance, Reynolds Model law & Frouds Model Law and their applications for model studies of hydraulic structures, Distorted and undistorted models, Scale effect.

Impact of jet - Impact of jet on plane and curved surfaces (stationary and moving), when jet striking normally at center of plate.

Pumps: Definition and types and suitability,
Centrifugal pump: Components and their functions, principle, working, priming, power required, Multistage pumps, pumps in series
Reciprocating pumps: Components and their functions, principle, working, power required

Modern Pumps: Deep submersible pumps- Components and working, Jet pumps, turbine pumps

Hydraulic turbines: Elements of hydroelectric power generation power plant, Hydraulic turbines-definition, Heads and efficiencies, Classification based on various criteria, Choice of turbine, Specific speed and its significance, Pelton wheel turbine and Francis turbine – suitability, components and their functions.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009
2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, Standard Publishers Distributors, New Delhi, 9th edition 2009.

Reference Books:

1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008
2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.
3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011
4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd, 1997.

CEU406 TRANSPORTATION ENGINEERING LAB

Teaching scheme: 02 P	**Total 01**	**Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE		**Total Marks: 50**
Duration of ESE : 3hrs.		

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU402) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. To determine the suitability of Aggregate for Road construction by conducting the various tests such as
   a. Crushing strength test,
   b. Los Angeles abrasion test / Deval abrasion test,
   c. Aggregate impact test,
   d. Aggregate Shape test - Flakiness index and elongation index determination.
2. To determine the suitability of Bitumen for Road construction by conducting the various tests such as
   a. Aggregate Bitumen adhesion test,
   b. Penetration test,
   c. Ductility test,
   d. Viscosity test,
   e. Softening point test,
   f. Flash and fire point test.
3. Determination of CBR value and design of flexible pavement

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU407 SURVEYING LAB

Teaching scheme: 04 P Total 04 Credit: 02

Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 100

Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU403) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Cross staff survey for measurement of area of field, calculation of area and measurement of area by digital planimeter
2. Chain / Tape & compass traversing for survey of a given area, entries in field book and plotting of features on ground on A1 size sheet
3. Plane table surveying for a given area and plotting of features on ground on A1 size sheet.
4. Profile levelling for minimum 500 m length and Plotting of L-section & cross section of road on A1 size sheet
5. Block contouring for minimum 200x200 m area and Plotting of contour map on A1 size sheet
6. Measuring horizontal angles, vertical angles, deflection angles, magnetic bearing, prolonging straight lines, lying off horizontal angles by Theodolite
7. Measurement of distances, angles, magnetic bearings for a traverse by Total station.

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU408 CONCRETE TECHNOLOGY LAB

Teaching Scheme: 02 P Total = 02 Credit : 1

Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 50

Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU404) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Fineness test on cement and its importance from strength point of view.
2. Soundness test on cement to study the expansion characteristics of cement.
3. Consistency test on cement to know the water requirement for hydration.
4. Setting time test on cement to know the hardening time required for placing the concrete.
5. Compressive strength test on cement to know the grade of cement.
6. Sieve analysis of aggregate (fine and coarse) to find the particle size distribution in a sample of aggregate.
7. Bulking of sand to know the increase in volume due to moisture content.
8. Silt content of sand to find impurities present in sand.
9. Workability of concrete: slump test to determine the ease of placing of concrete mix.
10. Workability of concrete: compaction factor test to determine the ease of plcacing of concrete mix.
11. Workability of concrete: flow table test to study flow characteristics of concrete.
12. Mix design by IS method to find the proportions of ingredients of concrete.
13. Compressive strength of concrete to know the grade of concrete.
14. Use of NDT methods of concrete for strength and durability.

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU409 OPEN CHANNEL FLOW & HYDRAULIC MACHINES LAB

Teaching scheme: 02 P **Total 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU405) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Determination of Chezy's / Manning's constant of uniform flow through prismatic channel
2. Calibration of rectangular/triangular notch
3. Determination of conjugate depths, length of jump, loss of head of hydraulic jump in laboratory tilting flume
4. Calibration of laboratory Venturiflume
5. Determination of hydraulic gradient of non-uniform flow in prismatic channel
6. Determination of Impact of jet on plates and vanes
7. Determination of efficiency of reciprocating pumps
8. Determination of efficiency of Centrifugal pumps
9. Determination of efficiency of Pelton wheel turbine & Francis turbine

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

GOVT. COLLEGE OF ENGINEERING, AMRAVATI

B. TECH. (CIVIL)
VII and VIII Semester
CURRICULUM

Department of Civil Engineering
2010-11

Govt. College of Engineering, Amravati
Department of Civil Engineering
Third Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE301	Mathematics-III	4	1	-	5	10	15	15	60	-	-	100	5
CE302	Strength of Materials	4	1	-	5	10	15	15	60	-	-	100	5
CE303	Engineering Geology	2	-	-	2	4	8	8	30	-	-	50	2
CE304	Construction Materials	2	-	-	2	4	8	8	30	-	-	50	2
CE305	Building Construction	4	-	-	4	10	15	15	60	-	-	100	4
CE306	Fluid Mechanics-I	3	1	-	4	10	15	15	60	-	-	100	4
CE307	General Profeciency-I	-	-	2	2	-	-	-	-	50	-	50	1
CE308	Strength of Materials-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE309	Engineering Geology - Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE310	Building Construction -Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE311	Fluid Mechanics-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	19	3	10	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE303 and CE 304 for which the ESE duration will be 2 hrs.

Fourth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE401	Economics & Humanities	4	0	-	4	10	15	15	60	-	-	100	4
CE402	Water Resource Engg-I	3	1	-	4	10	15	15	60	-	-	100	4
CE403	Fluid Mechanics II	4	1	-	5	10	15	15	60	-	-	100	5
CE404	Concrete Technology	3	1	-	4	10	15	15	60	-	-	100	4
CE405	Surveying I	4	1	-	5	10	15	15	60	-	-	100	5
CE406	General Profeciency-II	-	-	2	2	-	-	-	-	50	-	50	1
CE407	Fluid Mechanics II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE408	Concrete Technology-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE409	Surveying I-Lab	-	-	4	4	-	-	-	-	50	50	100	2
	Total	18	4	10	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min.

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Fifth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE501	Theory of Structure I	4	1	-	5	10	15	15	60	-	-	100	5
CE502	Design of Reinforced Concrete Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE503	Geotechnical Engineering -I	4	1	-	5	10	15	15	60	-	-	100	5
CE504	Surveying II	3	1	-	4	10	15	15	60	-	-	100	4
CE505	Building Design & Drawing	2	0	-	2	10	15	15	60	-	-	100	2
CE506	Computer Application in Civil Engineering-Lab	-	-	2	2	-	-	-	-	50	-	50	2
CE507	Design of Reinforced Concrete Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE508	Geotechnical Engineering -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE509	Surveying II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE510	Building Design & Drawing-Lab	-	-	4	4	-	-	-	-	25	25	50	2
	Total	16	4	12	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE502 and CE505 for which the ESE duration will be 3 hrs.

Sixth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE601	Design of Steel Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE602	Geotechnical Engineering -II	4	1	-	5	10	15	15	60	-	-	100	5
CE603	Environmental Engineering-I	4	0	-	4	10	15	15	60	-	-	100	4
CE604	Transportation Engineering-I	3	1	-	4	10	15	15	60	-	-	100	4
CE605	Estimating & Costing	3	1	-	4	10	15	15	60	-	-	100	4
CE606	Minor Project	-	-	2	2	-	-	-	-	25	25	50	2
CE607	Design of Steel Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE608	Geotechnical Engineering -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE609	Transportation Engineering-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE610	Estimating & Costing-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	17	4	10	31							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE601 and CE 605 for which the ESE duration will be 3 hrs.

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Seventh Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE701	Elective -I	3	1	-	4	10	15	15	60	-	-	100	4
CE702	Theory of Structure -II	3	1	-	4	10	15	15	60	-	-	100	4
CE703	Construction Management	3	1	-	4	10	15	15	60	-	-	100	4
CE704	Water Resource Engg. -II	3	1	-	4	10	15	15	60	-	-	100	4
CE705	Environmental Engg-II	3	1	-	4	10	15	15	60	-	-	100	4
CE706	Project & Seminar	-	-	4	4	-	-	-	-	50	-	50	3
CE707	Elective -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE708	Theory of Structure -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE709	Water Resource Engg. -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE710	Environmental Engg-II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	15	5	12	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except course CE702 for which the ESE duration will be 3 hrs.

Eighth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE801	Elective -II	3	1	-	4	10	15	15	60	-	-	100	4
CE802	Elective -III	3	1	-	4	10	15	15	60	-	-	100	4
CE803	Advance Structural Design	3	1	-	4	10	15	15	60	-	-	100	4
CE804	Transportation Engg-II	3	-	-	3	10	15	15	60	-	-	100	3
CE805	Project & Seminar	-	-	4	4	-	-	-	-	100	100	200	9
CE806	Elective -II-Lab	-	-	2	2	-	-	-	.	25	25	50	1
CE807	Elective -III-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE808	Advance Structural Design-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	12	3	10	25							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except course CE 803 for which the ESE duration will be 3 hrs.

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Sr. no.	Elective I	Sr. no.	Elective II	Sr. no.	Elective III
1	Structural Dynamics	1	Earthquake Resistant Design	1	Adv. Hydraulic Structures
2	Advance Geotechnical Engineering	2	Adv. Structural Analysis	2	Adv. Design of Steel Structure
3	Matrix Analysis of Structures	3	Pavement Design & Construction	3	Finite Element Methods
4	Water Treatment Process & Technology	4	Adv. Waste Water Treatment	4	Ground Improvement Technology
5	Traffic Engineering & Control	5	Adv. Foundation Engineering	5	GIS & Remote Sensing
6	Advance Hydraulics	6	Adv. Construction Management	6	Environmental Pollution & Soild Waste Management

CE701 ELECTIVE-I
A) STUCTURAL DYNAMICS

Teaching Scheme : 03 L + 01T Total 04 Credit : 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks :100
Duration of ESE: 2hrs.30 min.

Single degree freedom system, free vibrations, damped free vibrations, critical damping, and response, dynamic load factor
Single degree freedom system, response to impulsive loading, rectangular, triangular pulses, Duhamel Integral. Response to general dynamic loading, Numerical schemes such as constant, linear acceleration
Multi-degree freedom system, stiffness and flexibility approaches, Lumped-mass matrix, free vibrations fundamental Frequencies and mode shapes, orthogonality of modes, numerical schemes to find mode shapes and frequencies.
Multi degree freedom systems, response to dynamic loading, Formulations of equations of motion, normal coordinates mode superposition method, modal matrix.
Distributed systems, free vibrations of uniform beams, differential equation and Solution, boundary conditions, finite element, Ritz approach, free vibrations of simply supported plate. (Transverse vibrations)
Introduction to earthquake engineering

Textbooks:

1. Dynamics of Structures, R.W. Clough and J. Penzian, 2^{nd} edition, McGraw-Hill Inc, 1993
2. Introduction to Structural Dynamics, J.M. Biggs ,McGraw-Hill Book Co.1964

Reference books

1. Vibration Problems in Engineering, W. Weaver, Jr., S. P. Timoshenko and D. H. Young. Chichester, 5^{th} edition, John Wiley & Sons Limited,1990,
2. Structural Dynamics: Theory and Computation, Mario Paz, 2^{nd} Edition, CBS Publishers, 1987

CE701 ELECTIVE-I
B) ADVANCED GEOTECHNICAL ENGINEERING

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Clay Mineralogy-Atomic bonds, clay minerals, clay -water relations, electrical effects, cation exchange, clay mineral identification

Soil bodies Exhibiting non-homogeneous attributes, Influence of anisotropy in soil bodies, consecutive equations and models

Soil strength- Yield criteria, theories of failure, Effective stress principal, Stress path in various drainage condition.

Three dimensional consolidation- Equation, Solution of 3-D consolidation equation, consolidation by vertical sand drain and its design aspects, free strain consolidation with no smear, effect of smear zone on radial consolidation, calculation of degree of consolidation with radial drains and solution of problems based on it.

Seepage- Flow net for anisotropic soil media, construction of flow net for hydraulic structures on non-homogeneous soil, directional variation of permeability in anisotropic medium, Anisotropy governing differential equations for flow through porous media in Cartesian co-ordinate & polar co-ordinate system for Laplace Equations, Numerical analysis of seepage in layered soil, computation of seepage force.

Expansive soil- Black cotton soil, nature & characteristics of it, chemical composition, clay minerals, swelling potentials & its measurements, detrimental effects, measures to control its detrimental effects.

Collapsible soils – causes, properties of collapsible soils, collapse potential, collapse settlement, single & double oedometer test, single plate load test for determination of collapse potential treatment, foundations on collapsible soils.

Text Books:

1. Theoretical Soil Mechanics, M.E.Harr, 5th edn, McGraw Hill Publication, 1987.
2. Principles of Foundation Engineering, B.M. Das, 5th edn, Thomson Asia Pvt. Ltd, 2004.

Reference Books:

1. Geotechnical Engineering Principles & Practices, D. P. Couduto, 1st edn, Pearson Prentice Hall Publication, 2007.
2. Basic and Applied Soil mechanics, Gopal Ranjan & A. S. R. Rao, 2nd edn, New Age Int. Publication Pvt, Ltd, 2000.

CE701 ELECTIVE-I
C) MATRIX ANALYSIS OF STRUCTURES

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Flexibility method, static redundancy, flexibility coefficients, basic determinate, released structure, geometric compatibility conditions, matrix formulation, application to single bay single storey portals, pin jointed plane trusses. Settlement of supports and elastic supports.

Stiffness method, kinetic redundancy, degree of freedom, stiffness coefficient, joint equilibrium equations, structure and member approaches, member stiffness matrix, structure matrix, assembly procedure, application to plane frame with and without axial deformations, pin jointed trusses, numerical examples up to three unknowns.

Stiffness matrix of plane frame member with axial deformation (6x6), grid member (6x6), transformation of forces and displacements, member and global coordinate system.

Computer programs for solution of simultaneous algebric equations, Gauss elimination method. (FORTRAN / C language)

Data and program organization for stiffness method, various coding system, member-joint and joint-coordinate relations, member-displacement relation, code number approach, methods of introducing boundary conditions for restrained displacements, half band matrices.

Text Books:

1. Matrix Methods of Structural Analysis, Dr A.S. Meghre and S. K. Deshmukh, Charotar Publishing House, Anand, India, 2003.
2. Structural Analysis- A Matrix Approach: G. S. Pandit and S. P. Gupta, Tata McGrow Hill Publishing Company Limited, New Delhi, 1986.

Reference Books:

1. Analysis of framed structures: James M. Gere and William Weaver Jr., D Van Nostrand Company Inc., Affiliated East West Press Pvt. Ltd., 1965.
2. Matrix, Finite Element, Computer and Structural Analysis: M. Mukhopadhyay, Third Edition, Oxford & IBH publishing Co. Pvt. Ltd. 1993.

CE701 ELECTIVE-I

D) WATER TRETMENT PROCESS AND TECHNOLOGY

Teaching scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs. 30 min.

Requirement of water treatment facilities different unit operation and unit processes. Coordination of unit operations. Common attributes of water affected by conventional unit operation and processes

Aeration: rate of gas absorption and desorption, objectives of aeration, Types of aerators, Factors governing design of aerator.

Flocculation: objectives, chemical coagulation, concept of surface charge, coagulating effects of electrolytes, zeta potential, coagulants and coagulant aids, factors influencing coagulation. Perikinetic and orthokinetic flocculation. Mixing and stirring devices, construction and operation of flocculators, Design of flocuulator. Pebble bed flocculators.

Principles of sedimentation and floatation. General equations for settling of discrete particulates. Hindred settling, effect of Temperature, efficiency of an ideal basin, short-circuiting. Design , construction and operation of sedimentation tank.

Inlet and outlet arrangements, sludge removal. Tube settler and plate settler. High rate solid contact clarifier.

Filtration: Objective, design, construction and operation of rapid and slow sand filters. Filter media, grain size distribution, preparation of filter sand , hydraulics of filtration and hydraulics of fluidized beds. Scour intensification, Type of filter, high rate, contact rate, declined rate, up flow, dual media, Pressure filters, diatomaceous earth filter.

Disinfection: objectives, different disinfectants, chemical disinfection, theory, kinetics, factors affecting disinfection. Disinfection by chlorine, ozone and UV. Free available and combined available chlorine, Break point chlorination, disinfection in rural w/s.

Miscellaneous methods of treatment: Water softening, lime soda and zeolite process, split method, Calculation of dose of lime and soda ash. Methods of Iron and Manganese removal. Desalination. Removal of taste and adour.

Industrial Wastewater Treatment: Introduction, variation in quality and quantity of industrial wastewater. Indian standards for discharge of treated wastewater on land, into public sewer and inland surface water.

Text Books:

1. Water and Waste Water Engineering, Fair Geyer and Okun, John Willy and Sons, 1968.
2. Water and Waste Water Technology, Mark J. Hammer, 6th edition, John Willy and Sons, 2007.

Reference Books:

1. Water Supply and Sewerage, E.W.Steel and McGhee, 6th edition, Mc Graw Hill Company, 1991.
2. Manual on Water Supply & Treatment, CPHEEO, New Delhi, 1999.
3. Physico-Chemical Processes for Water Quality Control, Weber, John Wiley & Sons, 1972.

CE701 ELECTIVE-I
E) TRAFFIC ENGINEERING & CONTROL

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Introduction: 3E's of traffic Engineering, Special problems due to mixed traffic and other conditions in developing countries, Concept of PCU.

Traffic Characteristics: Road user characteristics. Traffic flow characteristics, Traffic flow forecast, Capacity, traffic studies, Speed and delay, Origin and destination, parking and accident

Traffic Facilities Design: Design of intersection, Rotary intersections, grade separated intersection

Traffic operation and Safety: Traffic regulations, Controls on vehicles, drivers and flow, One way street tidal flow operation, Traffic control devices, Temporary traffic control devices, Traffic safety, Traffic signs, Traffic signals, Design of Traffic signals, islands and marking, Design of isolated traffic signals by IRC method, Highway lighting, Awareness of Traffic safety, Factors affecting traffic safety.

Traffic and Environment: Pollution problem, Noise pollution, Air pollution, Environmental impact assessment due to different aspects of Traffic Engineering.

Text Books:

1. Principles of Traffic Engineering, G.J. Pingnataro, Mc Graw Hill, 1970
2. Traffic System Analysis for Engineering and Planners, Wohl and Martin, Mc GrawHill, 1983.

Reference Books:

1. Traffic Flow Theory, Ronald D. Drew, Mc Graw Hill, 1964.
2. Fundamentals of Traffic Engineering, Homburger, Kell and Perkins,13th edition, Institute of Transportation Studies, University of California, Berkeley, 1992.
3. Traffic flow Fundamentals, A. D. May, Prentice Hall Publication , 1990

CE701 ELECTIVE-I
F) ADVANCED HYDRAULICS

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Computation of uniform flow. Computation of critical flow. Theory of gradually varied flow. Analysis of surface profile of gradually varied flow.

Computation of gradually varied flow, Bresse's method, Chow's method, Direct step method, standard step method, Numerical method.

Equation of unsteady flow in a pipe line for incompressible fluid, Time of flow establishment, Rigid water column, theory of water hammer and computation of water hammer pressures.

Equation of unsteady flow in a pipe line for incompressible fluid, Time of flow establishment. Rigid water column theory of water hammer and computation of water hammer pressures.

Equation describing water hammer phenomena when compressibility of fluid and elasticity of pipe is considered, com0putation of water hammer pressure of frictionless flow in horizontal pipe, for sudden and slow closer of valve, Application of allievi's method of charts for calculation of approximate pressures. Water hammer pressures in pumping systems. Method of characteristics.

Computation of water hammer pressures in branched pipe system and in surge tank system. Various devices used for protection from water hammer pressures. Function of surge tank and different type of surge tanks. Equations governing the flow in the simple surge tank system. Analysis of flow in a simple surge tank system.
Computation of maximum surges in a simple surge tank, study of problem of hydraulic stability in a simple surge tank system.

Fluvial hydraulics including sediment transport, mode of sediment motion and bed formation, threshold movement, total sediment load, suspended and bed load theories.

Text Books:

1. Flow through open channels; Ranga Raju K.G.; Tata McGraw Hill,1998
2. Open channel hydraulics; Ven Te Chow; McGraw Hill,(International Student Edition), 1980.

Reference Books:

1 Flow in open channels; Subramanys K. Tata McGraw Hill,1999
2 Fluid Mechanics; Streeter & Wylie;McGraw Hill, International Student Edition,1996
3 Fluid Mechanics; Narasimhan S.; Engineering Vol. II, Orient Longman Publication,1981.
4 Mechanics of Sediment Transport and Alluvial River Problem; Garde, R. J. New Age Publication, New Delhi.

CE 702 - THEORY OF STRUCTURES – II

Teaching Scheme: 03 L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 3hrs.

Slope deflection method: Application to portal frames with side sway.

Moment Distribution method: Application to portal frames with side sway, multibay, multistory symmetrical frames subjected to symmetric load only

Kani's method: Continuous beams and single bay single storey portal frames, Frames with side sway, Multi-bay multi storeyed frames subjected to symmetric loads.

Influence line diagram upto two span for non determinant structures.

Catigliano's theorems, principle of least work, Analysis of single bay single storey portal frames (upto two degree of redundancy)

Analysis of redundant trusses (up to second degree of redundancy) using Catigliano's theorem

Introduction to Matrix Methods, Flexibility method, static redundancy, flexibility coefficients, application to beams

Stiffness method, kinematics redundancy, application to continuous beams

Text Books:

1. Basic Structural Analysis, Reddy C. S., 2nd edn, Tata – McGraw Hill, New Delhi, 2004.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc, 1983

Reference Books:

1. Elementary Structural Analysis, Utku, Norris and Wilbur, 4th edition, McGraw Hill Inc, 1991
2. Structural Analysis, R.C. Hibbler, 4th edition, Prentice Hall, 1999
3. Theory of Structures, Stephen P. Timoshenko and D. H. Young, 2nd edition, McGraw-Hill, 1965

CE 703 - CONSTRUCTION MANAGEMENT

Teaching Scheme : 03 L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

General Management – Evolution, applicability, definition, theories, Comparison between traditional management and modern scientific management, roles of Frederick Winslow Taylor, Henry Fayol, Elton Mayo, Mary Parker Follet, A.H.Maslow, Gilbren and Douglas Mcgregor, Management functions and Management styles.

Project management : Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality , project clearance Procedures and necessary documentation for major works like dam, multi-storied structures, ports, tunnel, bridges, roads.

Resource Planning and Scheduling: PERT/CPM :Critical path theory and application. Bar chart , Grant chart Construction Scheduling – Work break down structure, activity cost and time estimation in CPM, PERT , Network compression and resource leveling / smoothening.

Materials Management-Role and objectives of materials management, Materials Procurement and Delivery, Inventory control- EOQ techniques

Construction Equipment-Choice of Equipment and Standard production Rates, Economic Cost of Equipment, Replacement analysis, downtime cost and obsolescence costs.

Personnel management: Importance, functions and mechanism of implementation of the functions.

Text Books:

1. Construction Equipment and its Planning and Application, Dr. Mahesh Varma, Metropolitan Book Company, New Delhi-, 1983,
2. Construction Accounting and Financial Management, William Palmer, 5th edn, McGraw-Hill Professional Publishing, 1999.
3. Materials Management, D. S. Ammer, 3rd edn., Pub.: R. D. Irwin, 1974
4. CPM in Construction Management – James O'Brien, Tata McGraw Hill, New Delhi, 6th edn., 1999

Reference books:

1. Construction Project Management Planning, Scheduling and Controlling- B. Sengupta & H. Guha , Tata McGraw Hill, New Delhi
2. Principles of Construction Management, Roy Pilcher, 3rd edition, McGraw-Hill, June 1992.
3. CPM in Construction Practices, Antil and Wood Head, 4th edn., John Wiley Pub., 1990.

CE704 - WATER RESOURCE ENGG. II

Teaching scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Different types of Dams and their suitability, factors governing the selection of types of dam, various components of dams, control levels,

Reservoir Planning, selection of site, various investigations,

Reservoir Capacity, Sedimentation & factors governing the sedimentation, Life of Reservoir.

Types and elements of earth dam, seepage and drainage arrangement, phreatic line, design of section, stability analysis, causes of failure, seepage control measures

Types of Gravity Dams, forces acting, Elementary and practical profile, design of gravity dams, Earthquake and its effect on dams, Galleries, construction of Gravity Dam, preparation of foundation, grouting, concrete for dams, rolled concrete construction.

Spillway capacity, Flood routing through spillways, Types of spillway and their principles of design and construction, energy dissipation below spillway including its type, objectives different types of crest gates.

Selection of site and layout of Diversion Head Works, its components, safety against piping and uplift, Bligh, Lane, and Khosala's Theories, design of weirs on permeable foundation.

Types of canals, Parts of Canal irrigation system, Canal alignment, Design of unlined and lined Canals, Balancing depth, cross section of canal, propose and types of canal lining

Types and only design principles and description of Canal fall's, Head Regulator, Cross regulator, Canal escapes and canal outlets, Aqueduct, Siphon aqueducts, super passage, canal siphon, level crossing, Non modular modules, flexible modules, rigid modules.

River Training Works: Need and types of river training works.

General features of Hydro-power, general layouts of different types, main components of Hydro-power schemes,

Text books:

1. Irrigation Water Resources and Water Power Engineering, Dr. P.N. Modi, Standard Book House, New Delhi, 2009
2. Irrigation Engineering and Hydraulic Structures, R. K. Sharma, Oxford and IBH Publishing Company, New Delhi, 1994.

Reference books:

1. Concrete Dams, R. S. Vershney, Oxford and IBH Publishing Co., New Delhi, 1982
2. Theory and Design of Irrigation Structures, R.S. Varshney, S. C. Gupta and R.L. Gupta, Nemchand & Brothers, Roorkee, 1992.
3. Water Resources Engineering, R.K. Linsley and J.L.H. Paulhus, McGraw Hill Book Co., 1992.

CE 705 – ENVIRONMENTAL ENGG. – II

Teaching scheme : 03 L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Quantity and Quality of sewage: Components of sewage, Dry weather flow, Peak factor, Quantity of storm water, Rational formula, Ground water infiltration, Variation in flow rates, Waste water characteristics, First order BOD equation, COD, solids, Effluent standards for disposal of wastewater on land, into streams, in sewers; Stream pollution, Self purification, DO sag curve, Stream classification, Fair's factor, Problems DO sag curve

Sewerage systems: Separate, partially separate, and combined sewerage systems; Types of sewer pipes: material and shape; Sewer appurtenances, Manholes, drop manholes, inverted siphon, Over flow weirs, ventilation, Flushing tanks; Layout generation; Sewage pumping: Necessity, Location, Sewage pumping station.

Design of sewers: Manning's equation, Self-cleansing velocity, Non-scouring velocity, Full-flowing sewer, Partially-full flowing sewers, Self cleansing slope, Design and analysis of sewer, Cost of sewer based on cost of excavation and pipe

Sewage Treatment: Flow diagram of conventional STP; Primary treatment, Screen chamber: Types, Function; Grit chamber: Function, Velocity control, Oil and Grease tank; Primary settling tank: Surface over flow rate, Weir loading, Design problems; Secondary treatment, Trickling filters: Standard rate, High rate, Rate of filtration, Recirculation, Efficiency, Modifications, Design of trickling filters; Activated sludge process: Process description, loading rates, MLSS, MLVSS, SVI, F/M, Mean cell residence time, Design of conventional ASP; Secondary clarifier; Sludge treatments: Aerobic and anaerobic digestion, Effect of pH and temperature, sludge drying beds

Low cost waste treatments: Oxidation ponds, facultative pond, Oxidation ditch, Septic tank, soak pits, dispersion trenches, problem on design of oxidation pond, oxidation ditch and septic tank

Air and noise pollution: Sources of air pollution: Primary and secondary, Stationary and mobile sources, Effect of air pollution on man, material, and plants; Bhopal gas tragedy, Principle and working of Settling chambers, Electrostatic precipitators, Air quality standards, Sources, Noise Pollution Measurement, Decibel scale, Computation of noise, Effect, Control measures, tolerance levels

Solid waste management: Types, Sources, Composition, Collection systems, Frequency of collection, Sanitary land fill, Composting, EIA and Acts: Introduction to EIA; Water Act, 1974; Air Act, 1981; Environmental Protection Act (1986)

Text Books:

1. Environmental Engineering, H. S. Peavy, D. R. Rowe and T. George, McGraw-Hill Book Company, New Delhi, 1985.
2. Environmental Engineering, Gerard Kiely, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

Reference Books:

1. Manual on Sewerage and Sewage Treatment, Central Public Health and Environmental Engineering Organization, Government of India Publication, New Delhi, 1993
2. Waste Water Treatment, M. N. Rao and A. K. Datta, Oxford and IBH Publishing Co. Private Limited, New Delhi, 2003.
3. Wastewater Engineering, Metcalf and Eddy, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.
4. Air Pollution, Rao, M. N., and Rao, H. V. N., Tata McGraw Hill Publishing Company Limited, New Delhi, 1989.
5. Solid Waste Management in Developing Countries, Bhide, A. D., and Sundrasen, B. B., Indian National Scientific Documentation Centre, New Delhi.

CE 706 PROJECT AND SEMINAR

Teaching Scheme: 04 P Total = 04 **Credit : 3**
Evaluation Scheme: Internal = 50 **Total Marks: 50**

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50 marks divided in two parts, 25 marks for seminar and 25 marks for project work.

A. Seminar

1. Student shall select a topic for seminar which is not covered in curriculum. Student shall complete the conceptual study of the selected topic and expected to know functional and technical details of selected topic.
2. Before end of semester student shall deliver a seminar and submit the seminar report in proper format.
   Introduction
   Literature Survey
   Concept
   Functional and Technical Details
   Future scope
   Applications
   Comparison with similar topics / methods
   References

3. Student shall deliver a seminar on submitted report which shall be assessed for 25 marks by two examiners
    1) Project Guide
    2) Senior faculty appointed by HOD

B. Project

1. In general a group of 4-5 students should be allowed to complete one project.
2. Student should complete the literature survey and finalized the topic for the project
3. They shall submit the synopsis on the selected topic to HOD
4. On approved topic base work should be complete.
5. At end of semester, group should submit the progress in proper format.
6. Oral examination for 25 marks shall be conducted on the progress report by the examiner panel as follows
    1) Project Guide
    2) Senior faculty appointed by HOD

CE707 ELECTIVE-I LAB
A) STUCTURAL DYNAMICS - LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum five experiments should be performed.

1. Dynamics of a three storied building frame subjected to harmonic base motion.
2. Dynamics of a one-storied building frame with planar asymmetry subjected to harmonic base motions.
3. Dynamics of a three storied building frame subjected to periodic (non-harmonic) base motion.
4. Vibration isolation of a secondary system.
5. Dynamics of a vibration absorber.
6. Dynamics of a four storied building frame with and without an open ground floor
7. Dynamics of one-span and two-span beams.

A Report based on above shall be submitted by each student.

Practical Examination;

Practical examination shall consist of oral examination based on Report.

CE707 ELECTIVE-I LAB
B) ADVANCED GEOTECHNICAL ENGINEERING - LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

1. Model Field Swelling Pressure test.
2. Differential & Free swell Index
3. Design of vertical sand drains
4. Drawing of flow net for hydraulic structures on non-homogeneous section
5. Report of field visit to any project under construction
6. Computation of seepage in layered soil.
7. Laboratory Swelling Pressure test.
8. Stress-path in various drainage condition.
9. Determination of collapse potential by single oedometer test
10. Determination of collapse potential by double oedometer test

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE707 ELECTIVE-I LAB
C) MARTIX ANALYSIS OF STRUCTURES - LAB

Teaching Scheme: 02 P Credit : 1
Evaluation Scheme: Internal = 25, External=25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

1. Write a program for Gauss elimination method of solving simultaneous equations.
2. Analyse a truss by flexibility method.
3. Analyse a continuous beam by flexibility method.
4. Analyse a continuous structure with elastic support by flexibility method.
5. Analyse a frame by stiffness method.

6. Develop a program for generating element stiffness matrix of a typical plane truss element.
7. Develop a program for generating element stiffness matrix of a typical plane frame element.
8. Develop flowchart for a computer program for analyzing a plane frame/plane truss by stiffness method.
9. Develop assembly subroutine of program for analysis of plane frame/plane truss by stiffness method.
10. Generate input data software for analyzing a plane frame/plane truss by stiffness method. Use both types of code numbering.
11. Develop subroutine of program for feeding data of plane frame/plane truss by stiffness method.
12. Develop subroutine of program for adding joint loads to stiffness formulation of a structure to be analysed by stiffness method.
13. Matrix operations using Excel, MATLAB or any computing tool.

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE707 ELECTIVE-I LAB
D) WATER TRETMENT PROCESS AND TECHNOLOGY- LAB

Teaching scheme : 02 P **Credits: 01**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Design of various individual treatment units such as Aeration, sedimentation, flocculation, computation of quantity of coagulant filtration, softening. (Any Five)
2. Design of water treatment plant for the given population along-with hydraulic computations and layout plan and sectional elevation for each unit.
3. Report based on visit to water treatment plant.

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE707 ELECTIVE-I LAB

E) TRAFFIC ENGINEERING & CONTROL - LAB

Teaching scheme : 02 P **Credits: 01**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Any five experiments should be performed.

1. Design problem on Traffic study
2. Design of intersection
3. Design problem on Traffic flow forecast
4. Design of Traffic signals
5. Case study on Environmental impact assessment due to different aspects of Traffic Engineering.
6. Case sturdy of traffic at any square with all aspect.

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE707 ELECTIVE-I LAB
F) ADVANCED HYDRAULICS

Teaching Scheme: 02 P **Total = 02** **Credit : 1**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Design and drawing of surge tank

1. Plotting of various GVF surface profiles
2. Plotting of GVF using standard step method
3. Analysis of pipe flow for water hammer pressure
4. Field visit report to any hydropower station

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE 708 - THEORY OF STRUCTURES – II - LAB

Teaching Scheme: 02 P **Total = 02** **Credit : 1**

Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum five experiments should be performed.

1. Electrical resistance linear strain gauge for measuring static strains.
2. Influence line diagram for reactions of continuous beams
3. Influence line diagram for moment at fixed support for propped cantilever beams
4. Experimental study of buckling of slender columns and to find collapse load for various fixing conditions
5. Forces and displacements in redundant trusses and frames.
6. Study of polariscope
7. Experimental study of beam end rotations
8. Verification of Betty theorem
9. Verification of Maxwell Reciprocal Theorem.
10. Experimental study of beam deflections under different fixing conditions
11. Experimental study of rectangular portal frame subjected to vertical loads
12. Application for moment indicator.
13. Horizontal reaction of two hinge arch

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE709 - WATER RESOURCE ENGG. II – LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum seven experiments should be performed.

1. Using Topo-sheet, average annual rainfall; determining yield including Fixing control levels of Reservoir.
2. Design and Stability analysis of Gravity dam
3. Design & Stability analysis of an Earth Dam
4. Design of a spillway and stilling Basin.
5. Design of canals
6. Design and analysis of a weir on permeable foundation

7. Drawing of cross drainage works
8. Study of any one type of river training work.
9. A typical layout of a high head hydropower plant, function of the components
10. A report based on field visit to any irrigation project during the academic term

A Report based on above along with drawings on drawing sheets shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE 710 – ENVIRONMENTAL ENGG. II - LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Analysis of water and waste water samples: pH, Hardness, Chloride, DO and BOD, COD, Alkalinity, Acidity and Turbidity, Solids, Iron, Calcium, Residual chlorine, Alum Dose (Any six)
2. Demonstration of high volume air sampler and Measurement of sound level (Any one)
3. Design of Grit Chamber, Primary settling tank, High rate trickling filter, Septic tank, Sludge Digester (Any Three)
4. Report based on visit to WWTP / Sewage Treatment Plant.

A Report based on above along with drawings on drawing sheets shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE801 ELECTIVE-II
A) EARTHQUAKE RESISTANT DESIGN

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Indian seismic codes, seismic design philosophy for buildings, concept of earthquake resistant structures

Behavior of reinforced concrete building in earthquake

Introduction to IS 1893-2002, Structural response to earthquake, analysis of multistoried frames by Equivalent static analysis method

Introduction to IS 13920, design strategy, strength, ductility of reinforced concrete members

Ductile design and detailing of reinforced concrete beams

Ductile design and detailing of reinforced concrete columns

Design strategy, strength, ductility of beam column joints

Seismic analysis of water tank resting on ground

Text Books:

1. Earthquake resistant Design of Structures, S. K. Duggal, Oxford University Press Publications, First edition, 2007
2. Earthquake resistant design of structures, Pankaj Agrawal and Manish Shrikhande, Prentice Hall of India Pvt, Ltd. Publications, 2006.

Reference Books:

1. IS 1893:2002, Criteria for Earthquake Resistant Design of Structures, Part I, Bureau of Indian Standards, New Delhi, 2002.
2. IS 13920: 1993, Ductile Detailing of Reinforced Concrete Structures subjected to Seismic forces - Code of practice, Bureau of Indian Standards, New Delhi, 1993.
3. Earthquake Design Practice for buildings, Davide Key, Thomas Telford Ltd., Landon, First edition, 1988.
4. Seismic Design of Reinforced Concrete and Masonry Buildings, Paulay, T., M.J.N. Priestley, John Willey and Son's Publications, First edition ,1992
5. Handbook of seismic analysis and design of structure, Farzad Neaim
6. www.nicee.org

CE801 ELECTIVE-II
B) ADV. STRUCTURAL ANALYSIS

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Approximate methods of analysis of multi-bay multi-storey Frames by- Cantilever method, Portal method & Factor method.

Shear centre for thin walled beam section symmetrical about one axis

Cantilever moment distribution method, application to rigid jointed plane frames. Virendeel girders-analysis for vertical sway cases only.

Minimum potential principal, Rayleigh & Rayligh-Ritz method, application to simply supported and cantilever beams using power series and trigonometric series

Introduction to theory of elasticity – (treatment in Cartesian co-ordinates), state of stress at a point, stress equilibrium equations, strain-components, stress strain relations, generalized Hooke's law, plane stress and plane strain conditions, stress and strain compatibility for 2D

Analysis of beams circular in plan.

Text Books:

1. Basic Structural Analysis, Reddy C. S., 2nd edition, Tata – McGraw Hill, New Delhi,2004.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc, 1983

Reference Books:

1. Structural Analysis, R. C. Hibbler, 4th Edition, Prentice Hall of India Pvt., Ltd. Publications,1999
2. Theory of Elasticity, Timoshenko, S. P. and Goodid, J. N., 3rd Edition, Tata McGraw-Hill Publishing Co. Ltd., 1988
3. IS 1893:2002, Criteria for Earthquake Resistant Design of Structures, Part I, Bureau of Indian Standards, New Delhi, 2002.
4. Elementary Structural Analysis, Utku, Norris and Wilbur, 4th Edition, McGraw Hill Inc, 1991

CE801 ELECTIVE-II
C) PAVEMENT DESIGN AND CONSTRUCTION

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

General: Structural action of flexible and rigid pavements. Characteristics of highway and airfield pavements.

Design Parameters: Standard Axle load and wheel assemblies for road vehicles Under carriage system for aircraft, Tire and contact pressure, contact area imprints, Computations of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield pavement, airport traffic areas.

Material characteristics: AASHO sub grade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for "K", Marshal's method of Bituminous mix design. Modulus of rupture and elasticity, poison's ratio and coefficient of thermal expansion of concrete. Layer equivalency concepts.

Analysis of Flexible and Rigid Pavements: Stress, Strain deformation analysis for single, two three and multilayered flexible pavement systems. Stress and deflections for rigid pavements due to load and temperature, influence Charts, ultimate load analysis, joints in C.C. pavements.

Highway Pavement Design: Flexible: North Dakota Cone, Group index, CBR, IRC-37, Brumister, Triaxial (Kansas), AASHO method of design.
RIGID IRC-58, PA. C.A. AASHO method of design, Design of joints and reinforcement.

Airfield Pavement Design: Flexible :U.S.Corps of Engineering, CBR, FAA, Mcload (Canadian)

Rigid: PCA, FAA & LCN, ultimate load Analysis yield lines patterns, methods.

Pavement Testing and Evaluation: Pavement evaluation techniques including Bump integrators, Benkelman Beam, Falling weight deflectometer methods. Straightening of pavement: Design of flexible, composite and rigid overlays for flexible and rigid pavements, Repairs, Maintenance and rehabilitation of pavements. Specifications and Cost Estimates: Review of IRC / MORTH / CAO / NAAI Specification and standards for highway and airfield construction. Cost evaluation and comparative study. Pavement Management systems.

Text Books:

1. Principles of Pavement Design; Yoder & Witzace; 2nd edition, John Wiley & Sons, 1975.
2. Airport Planning & Design; Goyal & Praveen Kr.; Galgotia Publication, 2002. '

Reference Books:

1. Design of Functional Pavement; N.C Yang.;McGraw Hill,1990
2. Highway Engineering; S.C. Sharma Dhanpat Rai, 2000
3. Design and Performance of Road Pavement Croney & Croney; McGHraw Hill, 2002.
4. Highway Engineering; K. Khanna, and Justo, C.E.G., Khanna Publication, Roorkee, 2001

CE801 ELECTIVE-II
D) ADV. WASTE WATER TREATMENT

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Introduction to Waste Water Treatment: Classification of wastewater treatment methods, Application of treatment methods, Selection of treatment - process flow diagrams, Principles types of reactors.

Industrial Wastewater Treatment, variation in quality and quantity of industrial wastewater. Indian standards for discharge of treated wastewater on land, into public sewer and inland surface water.

Physical and Chemical Treatment: Screening, Grit removal, mixing, flocculation, sedimentation, Equalization and neutralization, floatation, gas transfer. Design principles and design of screens, grit chamber, sedimentation tank and equalization basin.

Biological Treatment: Fundamental of biological treatment. Introduction of suspended and fixed film reactors. Concept and design of activated sludge process and trickling filter. Design of secondary settling tank

Anaerobic Treatment: Theory and Design of anaerobic treatment process.

Tertiary Treatment: Principles of tertiary treatment, theory of adsorption and factors affecting the adsorption, concepts and different methods of dissolved solids removal.

Text Books:

1. Wastewater Treatment, Disposal and Reuse; Metcalf and Eddy, 3rd edn, McGraw Hill Pub. Co. Pvt. Ltd., New Delhi, 1991.
2. Waste Water Treatment; M.N. Rao and A.K. Datta, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi, 2003.

Reference Books:

1. Wastewater Treatment and Disposal; S.J. Arceivalla, Marcel Dekkar, 1981.
2. Environmental Engineering, H.S.,Peave, D.R. Rowe and T. George, McGraw Hill Pub. Co. Pvt. Ltd., New Delhi, 1985.

CE801 ELECTIVE-II
E) ADV. FOUNDATION ENGINEERING

Teaching scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Bearing capacity– Bearing capacity for footing on or adjacent to slopes, footing on non-homogeneous soil conditions, bearing capacity of rock.

Pile foundations – Uplift resistance of pile, Vertical piles subjected to lateral loads, Solution with soil modulus assumed constant, short and long piles, Hansen’s method, Broom’s method, Use of p-y curves, Deflection of vertical piles, Batter pile groups under inclined load, Culman’s method, Analytical method, Hrehnikoffi’s method, Brill’s approach,

Raft foundations – Types, Bearing capacity of rafts on sands and clay, Analysis of rigid rafts, Modulus of subgarde reaction and its determination, Effect of depth on subgarde reaction, criteria for rigid / Flexible raft, Raft analysis using modulus of subgarde reaction,

Well foundations – Depth of well foundation, Bearing capacity of well foundation, Loading on well foundation, Lateral stability of well foundation, Different methods of analysis – Terzaghi’s analysis, Banergee and Gngopadhyay’s method, IRC method, Design of components of well foundation.

Foundations in difficult soils: expansive soils, chemically aggressive environment, soft soils, fills, collapsible soils.

Anchored bulk heads - Free earth support and fixed earth support methods - Types of anchors, Design of anchors

Text Books:

1. Foundation Analysis and Design, J. E. Bowles, 5th Edition, McGraw Hill International, 1996.
2. Foundation Design & Construction, M. J Tomlinson, 7th Edition, Addison-Wesley Longman Ltd, 2001.

Reference Books:

1. Geotechnical Engineering, V. N. S.Murthy, Marcel Dekker Inc., New York, 2003.
2. Principal of Foundation Engineering, Das B. M., 5th Edition, Thomson Brooks/Cole, 2004
3. Design Aids in Soil Mechanics and Foundation Engineering, R. Kaniraj, 1st edition, Tata McGraw Hill, New Delhi, 2004.

CE801 ELECTIVE-II

F) ADV. CONSTRUCTION MANAGEMENT TECHNIQUES

Teaching scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Computerized Project Management: The Role Project Managers-Trends in Modern Management-Strategic planning and project programming- Leadership and Motivation for the Project team-Interpersonal behavior in project organization, Role and responsibility of PMC.

Construction Accounting and Finance: Project budgeting, Quality control and Quality Production-Audit in economic law of returns governing production Construction development in housing, Transport and other infrastructures

Resource Planning and Scheduling: Repetitive Project Modeling techniques. LOB technique, Mass haul diagrams. PERT/CPM, Precedence Network Analysis, Resources smoothing and Resources Leveling.

Human Resource Development and Management: Recruitment, Training of Construction Managers and team, Incentive Schemes – Necessity, Merit rating, job evaluation, installation, modification and maintaining and incentive scheme based on implementation experience, Theories of motivation and Organizational Behavior. Safety and Heakth-Discipline and Discharge-Special human resource problems, Performance appraisal

Project management software: Detailed study of the software used in Construction scheduling, budgeting, monitoring, updating, resource leveling in latest software's in construction project monitoring and control. Web based project management.

Project economics: Construction economics, Comparison of project costs and trade off analysis, Economy of scale and size. Choosing between alternatives including levels of investments. Project profitability.

Text Books:

1. Applied Project Engineering and Management , Ernest E. Ludwig, , Gulf Publishing Co., Houston, Texas,1988.
2. Computer Integrated Construction Project Scheduling, John Butterworth, Prentice Hall, ISBN: 0131114654, 2004
3. Practical Construction Management, R.H.B. Rans, Taylor & Francis Group 2nd edn., ISBN: 0415362571, 2005

Reference Books:

1. Cases in Construction Management, Slater W.J., Taylor & Francis Group, ISBN: 1850320322, 1988
2. Professional Construction Management, Barrie-Paulson-McGraw Hill Institute Edition. Construction Project Management: A Practical Guide to Field Construction Management; Publisher: John Wiley & Sons; 2nd edn., ISBN: 0070038473, 1984
3. Handbook of Heavy Construction, O'Brien, Havers & Stubb,, McGraw Hill, 1996

CE802 ELECTIVE-III
A) ADV. HYDRAULIC STRUCTURES

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Embankments : Earth and Rockfill Embankments, Forces acting on Embankments, General principles of design, Stability analysis, Foundation requirements, Embankment construction and Slope protection..

Gravity dams : Forces on gravity dams, Elementary profile, Design, Stability requirements, Foundation treatment, Mass concrete for dams, Structural joints and galleries.

Buttress dams: Types, Economic spacing of buttresses, Design of deck slab buttress dam, Advantages and limitations.

Arch dams: Types, Methods of design, Thickness of arch and central angle for minimum concrete.

Spillways: Types, Comparison, Components, Profile of Ogee spillway, Hydraulic design, Design of crest.

Energy dissipaters: Types, Components, Design of hydraulic jump type, Basins, Ski – bucket type roller bucket.

Intake structures for water supply and hydropower projects, Location and design of simple, differential and orifice type surge tank,

Text Books:

1. Earth and Rockfill Dam, J. L. Sherard, John Wiley, New York, 1963
2. Concrete Dam, R.S. Varshney, Oxford IBH, 1988

Reference Books:

1. Engineering for Dams Volume I,II and III, W. P. Creager and Justin J. D., John Wiley and Sons, 1964
2. Design of Small Dams, USBR, Oxford IBH, 1970.
3. Design of Large Dams, USBR, Oxford IBH, 1970.
4. Design of Gravity Dams, USBR, Oxford IBH, 1970.
5. Concrete Dams, H.D. Sharma., Metropolitan Book Co, New Delhi, 1981.

CE802 ELECTIVE-III
B) ADV. DESIGN OF STEEL STRUCTURE

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Design of industrial building including gantry girder, gantry column, Design of knee braces.

Analysis and design for transmission towers

Design of self supporting steel chimney and its foundation.

Design of through type truss bridge members for dead load and equivalent live load including top, bottom and portal bracings.

Design of North light trusses and lattic girder

Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, upper and lower bound theorems, Mechanism method to find collapse loads / plastic moment for beams, single bay single storey portals.

Text Books

1. Design of Steel Structures, by N.Subramanian, 1st edition, Oxford University Press, New Delhi, 2008
2. Design of Steel Structures, by Duggal .S.K., 3rd Edition, Tata McGraw Hill Publishing Company Limited, 2008

Reference Books:

1. Design of steel Structures, by Arya AS, Ajmani JL, Nem Chand & Brothers, Roorkee, 2007
2. Designs of Steel Structures, Raghupati, 1st Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2001
3. BIS 800-2007, Code of practice for general construction in steel, BIS New Delhi
4. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures, BIS, New Delhi

CE802 ELECTIVE-III
C) FINITE ELEMENT METHODS

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Continuum structures, discretization, finite elements, nodes, variational principle, minimum potential theorem, relation to Rayleigh-Ritz method.

Interpolation, Lagrangian, Hermitian shape functions, natural coordinates, area and volume coordinates, coordinate and derivative transformations.

2D plane stress and plane strain analysis, constant triangle, rectangular element, 3D analysis, tetrahedron and parallelepiped elements.

Introduction to Isoparametric elements, plane stress, plane strain and solid, numerical integration.

Programming aspect, geometry, connectivity, code numbers, alternative data types, half band data preparation, flow charts, typical subroutine for assembly, shape functions, solution of equations, stiffness matrix.

Text Books:

1. Concepts and Applications of Finite Element Analysis: R. D. Cook, Third Edition, Wiley India Text books, Wiley India Pvt Limited, 1989.
2. Introduction to Finite Elements in Engineering, Chandragupta T. R. and Belegundu A. D., 3rd edn., Prentice Hall, 2002.

Reference Books:

1. Finite Element Analysis: Theory and Programming: C. S. Krishnamurthi, Second Edition, Tata McGraw Hill Publishing Company Limited, 1994, Reprint 2005.
2. The Finite Element Method for Engineers: K. H. Huebner, D. L. Dewhirst, D. E. Smith and T.G. Byrom, Fourth Edition, John Wiley and Sons, Inc., , 2001.
3. Matrix and Finite Element Analysis of Structures: Madhujit Mukhopadhyay and Abdul Hamid Sheikh, First Edition, Ane books Publication, 2004.
4. The Finite Element Method (Volume -I): O. C. Zienkiewicz and R. L. Taylor, First Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 1989

CE802 ELECTIVE-III
D) GROUND IMPROVEMENT TECHNOLOGY

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Principle & methodology of soil stabilization, Different methods of soil stabilization such as granular stabilization, Chemical stabilization, Cement stabilization, Lime stabilization, Fly ash stabilization, Bituminous stabilization, Thermal stabilization.

Bearing capacity improvement using Geosynthetics, Soilmass reinforcement geometry, mechanisms & modes of failure (BinQuet & Lee theory), foundation on soil with Geotextile reinforcement, design procedures.

Pavement construction using Geotextile- Mode of action, design & construction methods,

Reinforced retaining walls- Geotextile reinforced walls, Construction procedure, analysis, design, design of gabion walls, Geogrid soil walls construction & design

Deep compaction of granular soil, Vibroflotation, Vibrocompaction, Blasting methods.

Design of stone columns, Compaction piles, Dynamic consolidation, Preloading method,

Stabilization of soft soil, Lime columns, Bearing capacity of lime group, Design of lime column foundation.

Sand drains, Granular trench stabilization,

Grouting techniques, Hydrofracture grouting, compaction grouting, Jet grouting, Types of grouts, Design of soil grouting program, Grouting equipment, Quality control & testing.

Text Books:

1. Ground Improvement Techniques, Dr. P. Purushottam Raj, 1st edn., Laxmi Publication, Delhi, 1999.
2. Reinforced Soil and its Engineering Applications, Swami Saran, 1st edn, I. K. International Pvt. Ltd., 2006.

Reference Books:

1. Practical Foundation Engineering Handbook, R. W. Brown, MC GrawHill, ISBN 0070081948, 1995
2. Geosynthetics – An Introduction, G. V. Rao, Sai Masters Geo environmental Services Pvt. Ltd., Hydrabad, 2006.
3. Principles of Foundation Engineering, B.M. Das, 5th edn, Thomson Asia Pte Ltd, 2004.

CE802 ELECTIVE-III
E) GIS & REMOTE SENSING

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

GIS

Geographical information Systems; Definition & Importance of GIS, Functions of GIS, The four M's of GIS, Components of GIS system, Data input & output: GIS Data Models- Raster & vector Data models, Data structures, Concepts & Basic characteristics of Vectorization, Topology Generation, attribute data attachment, editing and analysis

Data presentation, Database design & structure, Data analysis & cartographic modeling, Digital Elevation model

Hardware & Software image processing System. Characteristics of arc info,

GIS software packages

Linkage of GIS to remote sensing

REMOTE SENSING

Definition of Remote Sensing & applications of Remote Sensing: Idealized remote sensing system, Electromagnetic energy & spectrum, Physics of Remote Sensing, photogrammetry, types of photograph and geometry of photograph, Sensors & Scanners, Resolution of Sensors, Multispectral, thermal & Radar, Spectral Signatures

Remote sensing observation platforms- Terrestrial Airborne & Space borne platforms, sunsynchronus & Geostationary satellite Indian Remote Sensing Programs.

Remote Sensing Data Products & their Types: Analogue & Digital data Formats, errors. Geometric & radiometric Corrections.

Interpretation Techniques: Elements & methods Relief displacement and vertical exaggeration, determination & Calculation of elevation from Remote Sensing Data.

Digital Satellite data products and their characteristics, different methods of digital satellite data interpretation,

Digital Image Processing: Image Rectification & restoration, image enhancements, image classification.

Global & Indian Remote Sensing Satellite, Remote Sensing Techniques in Geosciences, Visual Interpretation of satellite images

Text Books:

1. Remote Sensing- Principles and applications, Sabbins,F.F., 2nd edn., Freeman Publication 1985.
2. Remote Sensing & GIS, Chandra, A.M. & Ghosh S.K, Narosa Pub. House, New Delhi, 2006

Reference Books:

1. Image Interpretation in Geology, S.A. Drury, Allen & Unwin Publication 1987.
2. Remote Sensing &Image Interpretation, T.M. Lillesand, & R.W.Kieffer, John Wiley Publication, 1987.
3. Concepts And Techniques of geographic Information Systems, C. P. Lo, Albert K.W. Yeung, Prentice Hall of India, 2002.
4. Remote Sensing Geology, Gupta, R.P., 5th edn., Springer Verlag Publication, 1990.

CE802 ELECTIVE-III
F) ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

General components of environment. Nature and scope of Environmental pollution, population growth, Degradation due to human activity, Episodes of environmental pollution

Water pollution : Sources , effects on water bodies, dissolved oxygen sag curve, pollution control measures.

Air pollution: Sources, effect on human body, control measures.

Land pollution :sources and effect on the environment, control measures.

Noise pollution. Their sources, effects, control measures, human tolerance limits

Legislation for Environmental pollution, Environmental Impact Assessment.

Problems and impacts of solid waste in developing countries, Sources, types and composition of Municipal solid waste, quantity estimation and forecast.

Characteristics of solid waste, Sampling, analysis, Composition of industrial solid waste. Hazardous and toxic waste, treatment and disposal methods

Collection of solid waste, onsite handling and processing, Transfer and transport

Text Books:

1. Introduction to Environmental Engineering and Science, Masters M. Gillbert, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
2. Solid Waste Management in Developing Countries, Bhide A.D and Sundaresan B.B; INSDOC, New Delhi, 1983.

Reference Books:

1. Solid Waste Engineering: Principles and Management Issues, G. Techbanoglous, Elliasen, Mc-Graw Hill Book Co., 1972.
2. Solid Waste Management, D. Joseph Hagerty, Joseph L. Pavoni & John E. Heer Jr., Van Norstrand Reinhold Environmental Engineering Science, 1973.
3. Handbook of Solid Waste Management, Frank Kreith, 2nd edn. Mc-Graw Hill Inc., 2002.
4. Management of solid waste in developing countries, Frank Flintoff, 2nd edn., WHO Publication, 1984.

CE 803 – ADVANCE STRUCTURAL DESIGN

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 3hrs.

Portal frames: Design of portal frames (symmetrical frame for symmetrical loading) up to two bays, two storied

Combined footing: Analysis & design of combined footing (rectangular & trapezoidal)

Slabs: Design of interior panel of flat slab by direct design method,

Retaining walls: Design of cantilever & counter fort retaining walls

Water tanks: Design of circular & rectangular water tanks resting on firm ground by working stress method.

Prestressed concrete: Introduction to prestressed concrete, Materials and their characteristic, type of prestressing, methods and various prestressing systems. Losses of prestress

Analysis and design of slab & beams: single span slab & beams of rectangular& flanged section for limit state of flexural strength, Design for diagonal tension, Shear strength of prestressed concrete beams, recommendations of I.S. code, Design of shear reinforcement.

Analysis and design of end blocks in post tensional members- primary and secondary distribution zones, Bursting and spalling tensions.

Text Books

1. Limit State Design of Reinforced Concrete, P.C. Varghese, 1st edition, Prentice – Hall of India Pvt. Ltd New Delhi, 2001
2. Prestressed Concrete, Krishan Raju, 4th edition, Tata McGraw Hill, New Delhi, 2006.

Reference Books

1. Illustrated Reinforced Concrete design, Dr. V. L. Shah & Dr. S. R. Karve, 2nd edition., Structures Publishers, Pune, 2004
2. Reinforced Concrete Design, S Unnikrishna Pillai & Devdas Menon, 2nd edition, Tata McGraw Hill, New Delhi, 2003.
3. BIS 456-2000,Plain & Reinforced Concrete, Code of Practice, BIS, New Delhi
4. BIS 875-1987(Part I-V),Code of Practice for Design loads for Buildings and Structures, BIS, New Delhi
5. Prestressed concrete structures, P. Dayaratnam., Oxford and IBH Publishing Company Private Ltd., New Delhi, 1991.

6. Design of Prestressed Concrete Structures, T.Y. Lin. and N.H. Burns, John Wiley and Sons, 1982.
7. BIS 1343-1980, Code of Practice for Prestressed Concrete *(First Revision)* BIS, New Delhi

CE 804 – TRANSPORTATION ENGG. – II

Teaching Scheme : 03 L + 00 T Total = 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

RAILWAY: Different modes of Transportation, Railway transportation, Importance of Railway Transportation in Nation Development, Characteristics of Railway Transport, Classification of Railway, Surveying, Track standard terminology, track sections in embankment and cutting.

Permanent Way : Requirement, components of permanent way, gauges, coning of wheels, Rail types and functions, defects in rails, Rail failures, Creep of rails, Rail joints, welding of rails, Sleeper density, Rail fixtures and fastenings.

Traction and tractive resistance, Different types of traction, hauling capacity and tractive effort of locomotive.

Geometric Design of railway track: Importance of Geometric Design, Gradients, speed, Super-elevation, cant deficiency, Negative super elevation, Grade compensation, Curves,

Points and crossings: Left and right hand turnouts, Design calculations for turnouts, & crossovers, types of track junctions.

Stations and yards: Types, functions, facilities and equipment.

Railway signaling: Objects classification and types of signals.

AIRPORT : Development of air transportation in India Agencies controlling national and international aviation, various surveys to be conducted, airport site selection, drainage.

Airport obstructions: Zoning laws, imaginary surfaces, approach and turning zone.

Runway and Taxiway design: Orientation of runway, wind rose diagram, basic runway length and corrections, runway geometric design standards.

Airport layout, Terminal area, unit terminal concept, Apron, Apron layout, Aircraft parking, Hangers.

Environmental guidelines for Airport projects.

TUNNELS: Tunnel necessity, types, tunnel economics, tunnel alignment tunneling methods in soft soils and hard rock, size and shape of tunnels, tunnel lining, drainage, ventilation and lighting of tunnel.

BRIDGES: Components, classification and identification, data collection, site selection. Economic span, different structural forms – culverts, causeways, major and minor bridges, types of foundations, abutments piers and wing walls, bearing types and choices, Erection of bridge superstructure.

Repairs, maintenance, strengthening of bridge superstructure.

Text books:

1. A Text Book of Railway Engineering, S. C. Saxena & S. P. Arora, Dhanpat Rai Publications(P) Ltd., New Delhi, 2003.
2. A Text Book of Transportation Engineering, S. P. Chandola, S. Chand & Co. New Delhi, Reprint 2008.
3. Airport Planning & Design, Khanna S. K., Arora M. G. , Jain S. S. , 6th edition, Nemchand & Bros., Roorkee,1999
4. Tunnel Engineering, S. C. Saxena, Dhanpat Rai Publications(P) Ltd., New Delhi
5. Principles and Practices of Bridge Engineering, S. P. Bindra, Dhanpat Rai Publications(P) Ltd., New Delhi, 2001.

Reference books:

1. Railway Engineering, Satish Chandra and M.M. Agrawal, Oxford University Press, New Delhi, 2007.
2. Transportation Engineering and Planning, Costas P. and Prevedouros, 3rd edition, Prentice Hall, 2001.

CE 805 PROJECT AND SEMINAR

Teaching Scheme: 04 P Total = 04 Credit : 9
Evaluation Scheme: Internal = 100; External = 100 Total Marks: 200

1. Project work decided in previous semester will be continued.
2. Students should complete implementation of ideas given in synopsis, so that project work should be completed before end of semester.
3. Students shall submit the final project report in proper format which shall include the work of both semesters.

4. For uniform and continuous evaluation, evaluation committee for each group shall be formed by HOD in which guide must be a member. Internal marks should be awarded by committee at end of semester based on continuous evaluation.
5. Final examination of project shall include demonstration of working model, presentation of complete work and oral examination based on total project work. Project work shall be assessed by guide and one external examination.

CE806 ELECTIVE-II LAB
A) EARTHQUAKE RESISTANT DESIGN - LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

A report should consist of earthquake resistant design and detailing of different structural elements of G+1 reinforced concrete building.

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report.

CE806 ELECTIVE-II LAB
B) ADV. STRUCTURAL ANALYSIS- LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

Study of any one structural analysis software SAP / STRUDS / STRAP etc. Modeling, Analysis and interpretation of results of following structural components using software (Minimum three)

1. Continuous beam for different support conditions
2. Single bay single storey portal frames for different loading conditions
3. Analysis of multistory frame for earthquake forces
4. Analysis of determinate plane trusses
5. Analysis of indeterminate plane trusses
6. Analysis of space truss
7. Analysis of space frame

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE806 ELECTIVE-II LAB
C) PAVEMENT DESIGN AND CONSTRUCTION- LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Design and drawing of highway/airfield pavement project
2. Design & drawing of rigid highway/airfield pavement project
3. Report of field visit to any highway/airfield pavement project under construction

A Report based on above shall be submitted by each student.
Practical Examination:

Practical examination shall consist of oral examination based on Report

CE806 ELECTIVE-II LAB
D) ADV. WASTEWATER TREATMENT-LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Design and drawing of municipal wastewater treatment plant
2. Design and drawing of effluent treatment plant of any one industry
3. Report of field visit to any municipal wastewater treatment/effluent treatment plant.

A Report based on above shall be submitted by each student.
Practical Examination:

Practical examination shall consist of oral examination based on Report

CE806 ELECTIVE-II LAB
E) ADV. FOUNDATION ENGINEERING- LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum five experiments should be performed.

1. To determine the bearing capacity of footing on sloped ground.
2. To determine the bearing capacity of footing on multilayered soil
3. Design of piles subjected to lateral load.
4. Design of battered pile group under inclined load.
5. Design of raft foundation for a given data.
6. Design of Well foundation for a given data.
7. Field visit to foundation site

Lab Report:

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE806 ELECTIVE-II LAB
F) ADV. CONSTRUCTION MANAGEMENT TECHNIQUE- LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Use of project management software's for
    a. Project scheduling
    b. Resource allocations
    c. Project Budgeting
    d. Resource leveling

2. Visit to mega construction project to study practical construction management aspects given below through interaction with construction industry leaders,
    a. Site layout,
    b. Materials management,
    c. Cost control
    d. Project uncertainties and risks identification

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE807 ELECTIVE-III LAB
A) ADV. HYDRAULIC STRUCTURES - LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum four experiments should be performed.

1. Design and drawing of Earth(or Rockfill) embankment from given data
2. Design and drawing of Gravity dam from given data.
3. Layout of various types of Buttress dam (or Arch dam) and section at middle.
4. Design and drawing of spillway and stilling basin.
5. Design and drawing of surge tank (any two types)
6. Design and drawing of head regulator for earth dams

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE807 ELECTIVE-III LAB
B) ADV. DESIGN OF STEEL STRUCTURE -LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. A Lab report & Structural drawings (using AutoCAD / manually) on at least two designs from following

1. Design of industrial building components like gantry girder, gantry column, & knee braces.
2. Design for transmission towers
3. Design of self supporting steel chimney and its foundation.
4. Design of through type truss bridge members including top, bottom and portal bracings.
5. Design of North light trusses and lattice girder

Field visits on Steel Structures / Industrial buildings/ Railway Station / Bridges & report of the visits.

Practical Examination:

Practical examination shall consist of oral examination based on Report & Structural drawings.

CE807 ELECTIVE-III LAB
C) FINITE ELEMENT METHODS-LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum four experiments should be performed.

1. Give suitable discretisation for finite element analysis of given examples
2. Develop shape functions for nine noded plane stress element.
3. Develop finite element formulation for an 8 noded plane stress element.
4. Develop flow chart for a computer program for analysing any continuum structure by FEM.
5. Generate input data for software for analysis of any continuum structure by stiffness method. Use both the type of code numbering.
6. Mathematical modeling using any one FEM based software.
7. Study element library available in different software.
8. Develop assembly subroutine of program for analysis of any continuum structure.

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE807 ELECTIVE-III LAB
D) GROUND IMPROVEMENT TECHNOLOGY-LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum five experiments should be performed.

1. Evaluation of improvement in shear strength parameters of soil after stabilization
2. Design of foundation with geotextile reinforcement.
3. Design of pavement reinforced by geotextile.
4. Design of stone columns.
5. Design of Soil grouting program.
6. Design of Geotextile reinforced retaining wall.
7. Design of sand drains

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE807 ELECTIVE-III LAB
E) GIS & REMOTE SENSING -LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Interpretation of Imageries
    a. Interpretation of structural features such as Faults, Folds, Joints, Fractures, etc.
    b. Interpretation of Lithology such as Tone, Texture, Vegetation, etc.
    c. Interpretation of suitable site for construction

2. Study of GIS software
    a. Vector & Raster Methods
    b. Interrelating the Toposheet & Imagery of the given region

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE807 ELECTIVE-III LAB
F) ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT -LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum two designs should be performed.

1. Design problem on transportation of Solid waste.
2. Design problem on compost plant for treatment of municipal solid waste.
3. Design of incinerator.

A Field visit along with report on Pollution assessment of an operating industry.

A Report based on above shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Report

CE 808 ADV. STRUCTURAL DESIGN -LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. A Lab report & Structural drawings (using AutoCAD / manually) on at least any two designs from Part A and any two designs from part B

PART A

1. Design of portal frames (symmetrical frame for symmetrical loading) up to two bays, two storied
2. Design of combined footing
3. Design of interior panel of flat slab by direct design method
4. Design of cantilever & counter fort retaining walls

PART B

1. Design of single span slab
2. Design of rectangular& flanged beam.
3. Design of end blocks in post tensional members
4. Design of rectangular water tanks resting on firm ground by WSM

Field visits on RCC structures / pre-stressed concrete structure for studying various aspects & submission of report

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report & Structural drawings.

GOVT. COLLEGE OF ENGINEERING, AMRAVATI

B. TECH. (CIVIL)
V and VI Semester
CURRICULUM

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Third Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE301	Mathematics-III	4	1	-	5	10	15	15	60	-	-	100	5
CE302	Strength of Materials	4	1	-	5	10	15	15	60	-	-	100	5
CE303	Engineering Geology	2	-	-	2	4	8	8	30	-	-	50	2
CE304	Construction Materials	2	-	-	2	4	8	8	30	-	-	50	2
CE305	Building Construction	4	-	-	4	10	15	15	60	-	-	100	4
CE306	Fluid Mechanics-I	3	1	-	4	10	15	15	60	-	-	100	4
CE307	General Profeciency-I	-	-	2	2	-	-	-	-	50	-	50	1
CE308	Strength of Materials-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE309	Engineering Geology - Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE310	Building Construction -Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE311	Fluid Mechanics-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	19	3	10	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE303 and CE 304 for which the ESE duration will be 2 hrs.

Fourth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE401	Economics & Humanities	4	0	-	4	10	15	15	60	-	-	100	4
CE402	Water Resource Engg-I	3	1	-	4	10	15	15	60	-	-	100	4
CE403	Fluid Mechanics II	4	1	-	5	10	15	15	60	-	-	100	5
CE404	Concrete Technology	3	1	-	4	10	15	15	60	-	-	100	4
CE405	Surveying I	4	1	-	5	10	15	15	60	-	-	100	5
CE406	General Profeciency-II	-	-	2	2	-	-	-	-	50	-	50	1
CE407	Fluid Mechanics II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE408	Concrete Technology-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE409	Surveying I-Lab	-	-	4	4	-	-	-	-	50	50	100	2
	Total	18	4	10	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min.

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Fifth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE501	Theory of Structure I	4	1	-	5	10	15	15	60	-	-	100	5
CE502	Design of Reinforced Concrete Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE503	Geotechnical Engineering -I	4	1	-	5	10	15	15	60	-	-	100	5
CE504	Surveying II	3	1	-	4	10	15	15	60	-	-	100	4
CE505	Building Design & Drawing	2	0	-	2	10	15	15	60	-	-	100	2
CE506	Computer Application in Civil Engineering-Lab	-	-	2	2	-	-	-	-	50	-	50	2
CE507	Design of Reinforced Concrete Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE508	Geotechnical Engineering -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE509	Surveying II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE510	Building Design & Drawing-Lab	-	-	4	4	-	-	-	-	25	25	50	2
	Total	16	4	12	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE502 and CE505 for which the ESE duration will be 3 hrs.

Sixth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE601	Design of Steel Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE602	Geotechnical Engineering -II	4	1	-	5	10	15	15	60	-	-	100	5
CE603	Environmental Engineering-I	4	0	-	4	10	15	15	60	-	-	100	4
CE604	Transportation Engineering-I	3	1	-	4	10	15	15	60	-	-	100	4
CE605	Estimating & Costing	3	1	-	4	10	15	15	60	-	-	100	4
CE606	Minor Project	-	-	2	2	-	-	-	-	25	25	50	2
CE607	Design of Steel Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE608	Geotechnical Engineering -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE609	Transportation Engineering-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE610	Estimating & Costing-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	17	4	10	31							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE601 and CE 605 for which the ESE duration will be 3 hrs.

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Seventh Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE701	Elective -I	3	1	-	4	10	15	15	60	-	-	100	4
CE702	Theory of Structure -II	3	1	-	4	10	15	15	60	-	-	100	4
CE703	Construction Management	3	1	-	4	10	15	15	60	-	-	100	4
CE704	Water Resource Engg. -II	3	1	-	4	10	15	15	60	-	-	100	4
CE705	Environmental Engg-II	3	1	-	4	10	15	15	60	-	-	100	4
CE706	Project & Seminar	-	-	4	4	-	-	-	-	50	-	50	3
CE707	Elective -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE708	Theory of Structure -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE709	Water Resource Engg. -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE710	Environmental Engg-II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	15	5	12	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except course CE702 for which the ESE duration will be 3 hrs.

Eighth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE801	Elective -II	3	1	-	4	10	15	15	60	-	-	100	4
CE802	Elective -III	3	1	-	4	10	15	15	60	-	-	100	4
CE803	Advance Structural Design	3	1	-	4	10	15	15	60	-	-	100	4
CE804	Transportation Engg-II	3	-	-	3	10	15	15	60	-	-	100	3
CE805	Project & Seminar	-	-	4	4	-	-	-	-	100	100	200	9
CE806	Elective -II-Lab	-	-	2	2	-	-	-	.	25	25	50	1
CE807	Elective -III-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE808	Advance Structural Design-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	12	3	10	25							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except course CE 803 for which the ESE duration will be 3 hrs.

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Sr. no.	Elective I	Sr. no.	Elective II	Sr. no.	Elective III
1	Structural Dynamics	1	Earthquake Resistant Design	1	Adv. Hydraulic Structures
2	Advance Geotechnical Engineering	2	Adv. Structural Analysis	2	Adv. Design of Steel Structure
3	Matrix Analysis of Structures	3	Pavement Design & Construction	3	Finite Element Methods
4	Water Treatment Process & Technology	4	Adv. Waste Water Treatment	4	Ground Improvement Technology
5	Traffic Engineering & Control	5	Adv. Foundation Engineering	5	GIS & Remote Sensing
6	Advance Hydraulics	6	Adv. Construction Management	6	Environmental Pollution & Soild Waste Management

CE 501- THEORY OF STRUCTURES – I

Teaching Scheme : 04 L + 01 T Total = 05 Credits: 05
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.
Analysis of Continuous beam by theorem of three moments, sinking of support.

Castigliano's theorem for slope and deflection, Unit load method, slope and deflection in determinate beams and portals.

Deflection in determinate trusses.

Influence line diagrams for reactions, bending moment and shear force for determinate beams.

Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, absolute maximum shear force and bending moment

Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.
Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Slope deflection method: Analysis of continuous beams with and without sinking of support. Analysis of portal frames without side sway.

Moment Distribution method: Analysis of continuous beams with and without sinking of support and portal frames without side sway.

Text Books:

1. Basic Structural Analysis, Reddy C. S., 2nd edition, Tata – McGraw Hill, New Delhi, 2004.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc, 1983

Reference Books:

1. Elementary Structural Analysis, Utku, Norris and Wilbur, 4th Edition, McGraw Hill Inc, 1991
2. Structural Analysis, R.C. Hibbler, 4th Edition, Prentice Hall, 1999

CE502 DESIGN OF REINFORCED CONCRETE STRUCTURES

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 3hrs.

Concept of reinforced concrete, History of RCC, Role of structural design in RCC structures, materials, properties. Design considerations, Basic elastic theory (Working Stress Method)

Limit state method, comparison with working stress method, Modes of failure, Analysis at ultimate Limit state in flexure, basic concept of singly reinforced and doubly reinforced sections.

Analysis and design of one way single span slab and continuous slabs. Analysis and design of two way slab. Design of stairs -Doglegged type.

Analysis and design of beams, rectangular and flanged sections for bending moment and shear.

Analysis and design of columns, for axial, uni-axial and biaxial bending.

Design of isolated footings, square and rectangular subjected to axial load and bending moment (uniform depth only)

Complete design of simple small structures like canopies & parking sheds.

Text Books:

1. Limit State Design of Reinforced Concrete, Varghese P.C., 2nd Edition, Prentice – Hall of India Pvt. Ltd, New Delhi, 2002
2. Fundamentals of Reinforced Concrete, Sinha S.K and Roy S.K, Tata McGraw Hill, New Delhi, 2002

Reference Books:

1. Advanced Reinforced Concrete Design, Varghese P.C., Prentice – Hall of India Pvt Ltd, New Delhi.
2. Design of Concrete Structures, Nilson A. H., Darwin D. and Dolan C. W., Tata Mc Graw Hill, New Delhi
3. Reinforced Concrete Design, Pillai S. U. and Menon D., 2nd Edition, Tata Mc Graw Hill, New Delhi, 2003.
4. BIS 456-2000, Plain and Reinforced Concrete - Code of Practice, BIS, NewDelhi
5. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than earthquake)for Buildings and Structures, BIS, NewDelhi

CE503- GEOTECHNICAL ENGINEERING - I

Teaching scheme : 04 L + 01 T Total = 05 **Credits: 05**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Introduction to Soil and Soil Mechanics, Civil Engineering problems related to soils, Complexity of soil nature, Soil formation and soil types, Regional soil deposits of India, Names of some common soils that are used in practice.

Index properties of soil: Soil- a three-phase system, Solids-water-air relationships, water content, void ratio, porosity, degree of saturation, unit weight, specific gravity, their inter-relationships, Laboratory determination of water content by oven drying method, pycnometer method, torsion balance moisture meter method, In-situ determination of density by core cutter method and sand replacement method, Determination of specific gravity by density bottle and pycnometer method, Relative density, Grain shapes, Grain size distribution by sieve analysis, grain size distribution curve, Consistency of clays. Atterberg's limits and indices, Determination of consistency limits as per IS code, significance of consistency limits and indices.

Classification of soils: Necessity of classification, criteria for classification, classification based on grain size and plasticity, textural classification, Indian standard classification system, classified soils and its engineering properties.

Soil compaction: Necessity of compaction in field, Standard Proctor test, Modified Proctor test, compaction curve, OMC and Maximum dry density, Compaction curve for sand, factors affecting compaction, structure and engineering behaviour of compacted soil, Compaction in field, suitability of various compaction equipment, placement water content, compaction specification and field control.

Permeability: Permeability, Darcy's law, methods of determination of coefficient of permeability of soils – constant head and falling head permeability tests, factors affecting permeability, approximate coefficient of permeability of common soils, field permeability tests-pumping out and pumping in tests.

Seepage analysis**:** Seepage pressure, upward flow, quick condition, two-dimensional Laplace equation, Flow net and its properties, graphical method of flow net construction, determination of seepage by flow net, seepage force, phreatic line, Filters, graded filters, criteria for design of filters.

Shear strength of soil: Basic concept of shearing resistance and shearing strength, concept of failure, Coulomb's criteria of failure, failure envelope, components of shear strength of soil, cohesion and angle of internal friction, Mohr's circle of stress, Major and minor principal planes and stresses, determination of normal and shear stress on a given plane, shear strength equation in terms of principal stresses, Determination of shear strength of soil in laboratory – Unconfined compression test, Direct shear test, Tri-axial shear test, Laboratory vane shear test, their suitability, stress conditions in soil during test, effective stress, stress condition at failure in terms of total stresses and effective stresses, relationship among stresses at failure.

Consolidation: The consolidation process, spring analogy, consolidation of laterally confined soil, Terzaghi's theory of one-dimensional consolidation (no derivation), solution of the consolidation equation, Laboratory consolidation test, determination of coefficient of consolidation, square root time fitting method, logarithm of time fitting method, coefficient of compression, coefficient of volume change, consolidation settlement, consolidation of undisturbed specimen, determination of pre-consolidation pressure.

Stress Distribution: State of stress at a point, stress distribution in soil mass, Boussinesq theory and its applications, pressure distribution diagrams, contact pressure

Text Books:

1. Geotechnical Engineering, Murthy V. N. S., Marcel Dekker Inc., New York, 2003.
2. Geotechnical Engineering, Principals and Practices, Coduto D. P., 1st Edition, Prentice Hall of India Pvt., Ltd., New Delhi,1999.

Reference Books:

1. Soil Mechanics and Foundations, Muniram Budhu, 2nd Edition, Wiley Publishers, 2006.
2. Geotechnical Engineering, Gulhati S. K. and Datta M., 1st Edition, Tata MC GRaw Hill Publishing Company, New Delhi, 2005.
3. Soil Mechanics, Craig R. F., 7th Edition, Chapman & Hall, 2004.
4. SP: 36 (Part 1), Compendium of Indian Standards on Soil Engineering, Part 1, BIS New Delhi, 1988

CE504- SURVEYING - II

Teaching Scheme : 03L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Theodolite Traversing: Selection of traverse station, linear & angular measurements, Methods of traversing - fast needle method, included angle method, direct angle method, deflection angle method. Locating details in a Theodolite traverse, angle mis-closure, balancing the angles of the traverse, Latitudes and departure and its computation, Consecutive & independent co-ordinates, Gales Traverse table, checks in a closed traverse & an open traverse, error of closure.

Total Station Traversing: Selecting a job, scale factor setting, azimuth angle setting, entering instrument station data, recording back sight point, recording angle measurement data, recording distance measurement data, recording notes, calculating azimuth angle by coordinates, coordinate resection measurement, height resection measurement, offset measurement, single distance measurement, angle offset measurement, two-distance offset measurement, registering known point data, reviewing known point data, reading in registered coordinate data, outputting job data to host computer, Tacheometry: Purpose & advantages, Principle of Stadia methods, determination of Tachometric constants, Theory of analytic lens, fixed hair method and tangential method, formula for distance and reduced level, Tachometric survey, errors in Tacheometric surveying.

Curves: Classification, degree of curve, elements of simple circular curve, Theory & methods of setting out simple circular curves- chain & tape method , Instrumental method, obstacles in setting out curves,
Compound curve, theory and methods of setting out compound curves
Transition curve: Purpose, length of transition curve, Ideal transition curve, characteristics of transition curve, length of combined curve, methods of setting out combined curve – deflection angle method, tangent offset method. Spiraling compound curves.(No numerical)
Vertical curves: Types, properties, location of highest or lowest point, length of vertical curve, methods of setting out vertical curves
.
City Surveying: Control, equipment, topographic map, underground map, city property survey, location of details

Underground Surveying: Surface alignment, correlation of surface and underground surveys, transferring levels underground, underground bench marks, setting out of pipelines and sewers

Hydrographic Surveying: Necessity, control, shore line survey, river survey, gauges, sounding equipment and procedure of taking sounding, methods of locating sounding, three point problem- mechanical & graphical solutions

Remote Sensing: Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics, applications of remote sensing for survey works

Geographical Information System GIS & Global Positioning System (GPS): Components of GIS, advantages, functions of GIS, Raster and vector data, advantages and disadvantages, GPS, introduction, definitions, GPS receivers, antenna, advantages of GPS

Text Books:

1. Surveying & Leveling, Basak N., 1st Edition , Tata McGraw Hill, 2004.
2. Surveying Vol. I and II, Duggal S.K., 2nd Edition , Tata McGraw Hill, 2004.

Reference Books:

1. Surveying & Leveling Practice, Anderson J. M. and Mikhail E. M., 7th Edition, McGraw Hill, 1998
2. Surveying Principles and Applications, Kavanagh, 7th Edition, Prentice Hall, 2007
3. Surveying Fundamentals & Practices, Nathanson, Lanzafama and Kissam, 5th Edition, Prentice Hall, 2006
4. Surveying, Moffitt and Bossler, 10th Edition, Prentice Hall, 1998

CE505- BUILDING DESIGN & DRAWING

Teaching Scheme : 02 L + 00 T Total = 02 **Credits: 02**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 3hrs.

Methods of Drawings: Importance of building drawing in construction & estimation, Method of drawing- Selection of scales for various drawings, types of lines, methods of dimensioning in architectural drawing. Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS:962. Combined first angle & third angle method of projection, Layout of sheet for Civil Engineering drawing, Requirements of drawing as per plan sanctioning authorities, Perspective Drawing – one point perspective, two point perspective

Working Drawing: Concept of line plan & working drawings of the building, Developing working drawings of the building from the given line plan. Details to be incorporated in the working drawings, Necessity and use of working drawing, Site plan, Block plan, Layout plan, Foundation plan, Developing working drawing and foundation plan for load bearing and framed structures

Planning of residential building: Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement, Climate and design consideration, Orientation of buildings, requirement of the owner, alternatives of building types viz. individual bungalows, semi-detached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building, Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Building rules and bye-laws for residential buildings, conversion of land to non-agricultural lands, layout for a housing project.

Planning of Public buildings: Types of public building and their requirements, planning of public buildings

Text books:

1. Building Drawing, Shah M.G., Kale & Patki, Tata McGraw Hills Publishing Co., New Delhi
2. Architectural Working Drawings: Residential and Commercial Buildings, Spence William P., 1993

Reference books:

1. IS: 962-1989, Code of practice for architectural and building drawings, BIS, New Delhi.
2. AutoCAD Workbook for Architects, Shannon Kyles, Wiley-Blackwell, July 2008
3. Construction Drawings and Details for Interiors: Basic Skills, Kilmer W. O. and Kilmer R., John Wiley & Sons, 2003

4. Architectural Graphic Standards for Residential Construction: The Architect's and Builder's Guide to Design, Planning, and Construction Details, The American Institute of Architects, John Wiley & Sons, 2003.

CE506- COMPUTER APPLICATIONS IN CIVIL ENGINEERING - LAB

Teaching Scheme: 02 P **Total = 02** **Credit : 2**
Evaluation Scheme: Internal = 50 **Total Marks: 50**

List of Experiments

Any ten of following experiments using MS-EXCEL / MATLAB

1. Preparing a leveling page of field book, entering the sights and working out reduced level and applying checks
2. Preparing measurement sheet, entering data and calculations of quantities
3. Preparing Abstract sheet entering data and calculating the cost of work
4. Entering data of road project/ irrigation project and calculation of quantities of earthwork
5. Entering the data of grain size analysis and plotting the particle size distribution curve
6. Entering the data of Proctor compaction test and platting compaction curve.
7. Determining the dimensions of most economical channel section for given data
8. Plotting the hydrograph for given data
9. To find the moment of resistance of a singly reinforce beam for given data
10. Design of R.C.C. singly reinforced beam for given data
11. Design of R.C.C. one way / two way slab for given data
12. Design of R.C.C. column for given data
13. Plotting the SFD and BMD for given loading on a simply supported / cantilever beam
14. Plotting the stress-strain curve for M.S. Grade and Fe415 Grade Steel

A Lab Report based on above experiments shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE507 DESIGN OF REINFORCED CONCRETE STRUCTURES - LAB

Teaching Scheme: 02 P **Total = 02** **Credit : 1**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

A Lab report & Structural drawings (using AutoCAD & manually) on Designs of different structural elements of a single storey building shall be submitted by each student.

Field visit on any RCC framed structure & submission of the report on site visit

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE508- GEOTECHNICAL ENGINEERING – I – LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

List of Experiments

1. Determination of water content by oven drying method and torsion balance moisture meter method.
2. Determination of in-situ density of soil by core cutter method.
3. Determination of In-situ density of soil by sand replacement method.
4. Determination of specific gravity of soil by pycnometer method
5. Determination of Grain size distribution by sieve analysis
6. Determination of plastic limit, liquid limit and plasticity index of soil.
7. Determination of shrinkage limit of soil.
8. Determination of compaction properties of soil by Standard Proctor test.
9. Determination of coefficient of permeability of soils by constant head / falling head permeability tests,
10. Determination of consolidation characteristics of soil by conducting one dimensional consolidation test.
11. Determination of shear strength of soil by unconfined compression test.
12. Determination of shear strength of soil by Direct shear test.
13. Determination of shear strength of soil by Tri-axial shear test (Quick test)
14. Determination of shear strength of soil by Laboratory vane shear test.
15. Determination of C.B.R value of given soil sample.

A Lab Report based on above experiments shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE509 - SURVEYING – II - LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

List of Experiments

1. Theodolite traversing – selection of stations, measurement of internal angles by theodolite, traverse calculations, traverse adjustment by Gales traverse table, recording details by perpendicular offsets, Plotting the corrected traverse and details on A1 size drawing sheet.

2. Total Station traversing – Selecting a job, entering instrument station data, recording back sight point, recording angle measurement data, recording distance measurement data, offset measurement, outputting job data to host computer and taking out printouts
3. Finding out tacheometric constants of given tacheometer
4. Finding out horizontal and vertical distance of a given point from the instruction station using tacheometer
5. Finding out horizontal and vertical distance between two given points using tachometer
6. Setting out simple circular curves by offset from long chord method.
7. Setting out simple circular curves by offset from tangents
8. Setting out simple circular curves by deflection angles – single theodolite method
9. Setting out simple circular curves by deflection angles – Two theodolite method

A Lab Report based on above experiments shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE510- BUILDING DESIGN & DRAWING - LAB

Teaching Scheme: 04 P Total = 04 Credit : 2
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

PART 1 – MANUAL DRAWING

Developing following drawings on full imperial size sheets:

1. Developing working drawing of single storied residential building from the given line plan. (Load bearing structure)
2. Preparing line plan of residential building from the given data on the graph paper and developing its submission drawings as per requirement of the plan sanctioning authority (Framed structure) (Separate data should be given to group of students)
3. Developing line plans of public building from the given data (minimum 2 line plans to be drawn graph papers)
4. Sketch book containing at least 10 free hand sketches of building components and elevational features such as balconies, sun shades and sun breakers, grills, compound gates, grill doors, door panel designs, window frame design, etc.

PART 2 – CAD DRAWING

1.AutoCAD commands

Elements of Drawing Editor Screen, Basic drawing entities
Drawing commands – Point, Line, Rectangle, Arc, Hatch, Text, Table,
Use of Osnap
Dimensioning – Linear, aligned, continue dimensioning

Formatting – point style, line weight, line types, colour, text style, dimension style, table style, units
Editing commands – selecting objects, various methods of selection, Erase, Move, Copy, Break, Mirror, Rotate, Scale, Trim, Extend, Offset
Blocks- making and inserting blocks
Zooming and Panning
Saving & Printing the drawing – selection of scale

2.AutoCAD Drawings

Creating Working Drawings in AutoCAD of single storied residential building from the given line plan same as in exercise 1 of Part I and taking printouts

A Lab Report based on above experiments shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE 601 DESIGNS OF STEEL STRUCTURES

Teaching Scheme: 03 L + 01T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 3hrs.

Materials, structures and specifications-types of structural steel, mechanical properties of steel, advantages of steel as a structural material
The basis of structural design-design consideration, **code and specifications,** Failure criteria for steel

Working stress Method

Introduction to working stress method

Limit state method

Introduction to Limit State Method
Loading and load combination-loads-dead loads, imposed loads, temperature effect, earthquakes, determination of wind loads as per IS 875(part 3), load combinations
Connections-
Introduction to riveted connections
welded connections-advantages of welding, types and properties of weld, types of joint, weld symbols, design of welds, simple joints, moment resistant connections
Bolted connections-behavior of bolted connections, design strength of ordinary black bolt, simple connection, moment resistant connection
Design of tension member-types of tension member, factors affecting strength of tension member, design of tension member
Design of compression members—possible failure modes, classification of cross section, section used for compression members, effective length, single angle strut, built up compression members, column splicing for axial loads only.

Design of simple beams, behavior of beams in bending, design strength of laterally supported beams in bending, design strength of laterally unsupported beams in bending, maximum deflection, web buckling and crippling, introduction to plate girder design (no numerical problems on plate girder design)
Design of beam column-general behavior of beam column, interaction between beam-column and structure, beam column under biaxial bending
Design of column bases, types of slab bases, design of solid slab base for axial & eccentric loading

Text books

1. Design of Steel Structures, N. Subramanian, 1st Edition ,Oxford University Press India, 2008
2. Design of Steel Structures (By Limit State Method as Per IS: 800—2007), S.S. Bhavikatti, 1st Edition , I. K. International Pvt Ltd, 2009

Reference books

1. BIS 800-2007, Code of practice for general construction in steel, BIS New Delhi
2. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than earthquake)for Buildings and Structures, BIS, New Delhi
3. SP 6(Part I to Part 6) Handbook for structural engineers - Structural steel sections.

CE602 - GEOTECHNICAL ENGINEERING - II

Teaching Scheme : 04 L + 01 T Total = 05 **Credits: 05**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Soil exploration, planning, objectives and methods of exploration, soil boring, spacing and depth of boring, boring log, hand augers, wash boring, percussion drilling, rotary drilling, Type of samples and samplers, area ratio, inside and outside clearance, Soil investigation report

Field Tests: Plate load test, Standard Penetration test (SPT) , Static Cone Penetration Test (SCPT) and Dynamic Cone Penetration Test (DCPT), Field California Bearing Ratio test, Field vane shear test, geophysical methods such as electrical resistivity and soil refraction methods.

Bearing Capacity: Bearing capacity, its criteria, factors and various methods. Analytical Methods: Terzaghi's, Skemptons, Meyorhoff, BIS method for bearing capacity, Effect of water table, contact pressure distribution diagram below the base of footing. Bearing capacity based on plate load test results, SPT value, SCPT test results, Pressuremeter test,

Settlement: Evaluation of soils settlement : immediate, primary and secondary settlement for footing resting on homogenous, isotropic, cohesive and cohesionless soils related to single footing, combined footing, raft foundation etc, concept of differential settlement, factors and causes for differential settlement, standard requirement of total as well as differential settlement, service loads, proportioning of footing for uniform settlement.

Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sand and in clay, dynamic pile formula, Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, settlement ratio, behaviour of group of pile in sandy and in clayey solids, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for under-reamed pile in clay and sands, Total and differential settlement related to single pile and group of piles in sandy and in clays soils.

Well foundation: Component and their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting of wells, methods of correcting tilting and shifting. Bearing capacity of well foundation as per IS method.

Cofferdam: Its purpose, various types, their suitability.

Raft foundation: Its purpose, advantages, situation, classification of raft, criteria for rigid and flexible raft, design of raft foundation, concept of floating foundation.

Slope Stability: Slopes, uses and failure of slope, stability analysis of infinite and finite slope in sand, clay and c-ϕ soil; Tailors stability number, Swedish circle method, Friction circle method, Bishop Method, Concept of effective stress analysis.

Earth Pressure: Earth Pressure at rest, active and passive, Stages of plastic equilibrium Rankin's and Coulombs theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhann and Culmanns simple graphical methods

Ground Improvement: Methods of soil stabilization use of admixture (lime, cement, fly ash) in stabilization, Basic concept of reinforced soil, use of Geosynthetics material as a reinforcement, Vibro-flotation, sand column / stone column, preloading.

Text Books:

1. Geotechnical Engineering, Murthy V. N. S., Marcel Dekker Inc., New York, 2003.
2. Principal of Foundation Engineering, Das B. M., 5th Edition, Thomson Brooks/Cole, 2004

Reference Books:

1. Foundation Analysis and Design, Bowles J.E., 5th Edition, McGraw Hill International, 1996.
2. Foundation Design & Construction, Tomlinson, M. J., 7th Edition, Addison-Wesley Longman Ltd, 2001.

3. Design Aids in Soil Mechanics and Foundation Engineering, Kaniraj, R, 1st edition, Tata McGraw Hill, New Delhi, 2004.
4. SP: 36 (Part 2), Compendium of Indian Standards on Soil Engineering, Part 2, BIS New Delhi, 1988.

CE 603 – ENVIRONMENTAL ENGINEERING – I

Teaching Scheme : 04 L Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Sources of water: Surface water, Ground water, Infiltration galleries and their relative suitability; intake works, function, Types

Water quality: Impurities in water: Colour, Turbidity, pH, Chlorides, Hardness, Suspended solids, Dissolved solids, Residual Chlorine, Fluoride, MPN, Significance, Water quality standards

Demand of water: Water demand for domestic purposes, Fire demand, Per capita demand, Factors affecting consumption, Fluctuation in demand: Design period for water supply components, Population forecast: Arithmetical increase, Incremental increase, Geometrical increase, and Logistic curve methods
Transmission lines: Function, Hydraulic formulae: Hazen-Williams equation, Darcy Weisbach equation, Optimum diameter of transmission line

Distribution system**:** Types of distribution system: Continuous and intermittent supply systems, Gravity, Pumping and combined systems; Layout of distribution system: Dead end, Grid iron, Circular, and Radial systems; Design of hydraulic network: Residual pressures, Hardy Cross method, Equivalent pipe method

Service Reservoirs: Elevated service reservoir, Balancing reservoir, Necessity, Location, Capacity calculation by Arithmetic & Mass curve method; Types of pipes, Types of valves, function and location

Water Treatment: Flow diagram of conventional WTP; Aeration: Principle, Purpose, Design of cascade aerator; Flash mixer, function, design, power requirement; Flocculation: Coagulants, quantity of coagulants, Design of mechanical flocculator; Sedimentation: Plain settling tank, design of settling tank, Surface over flow rate, Detention period; flow through velocity, weir loading, design of Clariflocculator

Filtration: Rapid and slow sand filters: Number of filter units, Filter media, Rate of filtration, Under drainage system, Backwashing, Negative head, Operation and cleaning, Design of rapid and slow sand filters, Design of under drainage system, Pressure filter

Disinfection: Objectives, Methods of disinfection, Chlorination: Free and combined chlorine, Effect of pH, Bleaching powder, Types of chlorination, Pre-chlorination, Post-chlorination, Break point chlorination, Super chlorination; Rural water supply: rate of water supply, treatment schemes, disinfection methods

Tertiary treatments: Softening: Lime soda, Quantity of lime and soda, Ion exchange; Effect of fluoride, Fluoridation and De-fluoridation

Text Books:

1. Environmental Engineering, Gerard Kiely, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
2. Water Supply and Sewerage, McGhee T. J., 6th Edition, McGraw Hill Inc., New York, 1991

Reference Books:

1. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Government of India Publication, New Delhi, 1993
2. Environmental Engineering, A. P. Sincer and G. A. Sincero, Prentice-Hall of India Private Limited, New Delhi, 2004.
3. Environmental Engineering, H. S. Peavy, D. R. Rowe and T. George, McGraw-Hill Book Company, New Delhi, 1985.
4. Water Supply and Waste Water Disposal, Fair G. M. and Geyer J. C., John Wiley and Sons, Inc., New York, 1954

CE604- TRANSPORTATION ENGINEERING -I

Teaching Scheme : 03 L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Importance of Transportation in Nation Development, Different modes of Transportation, Characteristics of Road Transport, Classification of Roads, Road Patterns

Highway Planning & Engineering Surveys: Necessity of Highway planning, Review of Highway development in India after independence, Indian Road Congress, Motor Vehicles Act, Central Road Research Institute, National Highway Act, Highway Research Board, National Transport Policy committee, Planning Surveys, Preparation of Plans, Preparation of Master plan and its phasing, Highway alignment- requirements and factors affecting, Engineering surveys for highway location, Drawings and reports, Stages in new Highway Project,

Highway Geometric Design: Importance of Geometric Design, Design controls and criteria, Highway cross sectional elements, Camber – Definition & purpose, IRC recommendations, methods of providing camber in field, Width of pavement or carriageway – definition, IRC recommendations, Kerbs – Types, Road Margins – shoulders, parking lanes, Footpaths, bus bays, Drive ways, cycle tracks, Width of roadway or Formation width – IRC recommendations, Right of way – Factors affecting, Typical cross sections of roads in cutting and banking, Sight distance – Stopping sight distance, overtaking sight distance, overtaking zones, Intermediate sight distance, sight distance at intersections, Super-elevation – Maximum and minimum super-elevation, Steps for super-elevation design, attainment of super-elevation in field, Widening of pavement on curves – IRC recommendations, Methods of introducing extra widening in field, Gradient – Ruling gradient, limiting gradient, exceptional gradient, minimum gradient, IRC recommendations, Vertical curves – Summit curves – Types and length, Valley curves – length, Typical cross section of Highway in cutting and filling

Highway Traffic Study: Traffic characteristics- road user characteristics, Vehicular characteristics, Traffic studies – traffic volume studies, speed studies, origin and destination studies, traffic flow characteristics and studies, traffic capacity studies, accident studies, measures for reduction in accident rates.

Highway Materials and Testing: Stone aggregates- Desirable properties of road aggregates, Tests for road aggregates, Bituminous Materials – Bitumen, Tests on bitumen, cutback bitumen, Bituminous emulsions, Tar, Bituminous paving mixes, Design of bituminous mixes – Marshall method

Design of Highway Pavement: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Rigid pavement, joints in rigid pavement

Construction of Highway: W.B.M. roads- specifications of materials, construction procedure, Bituminous pavements - Types of bituminous constructions, construction procedure for Surface Dressing, Penetration Macadam, Bituminous Macadam, Bituminous Concrete, Cement Concrete pavements - construction of pavement slab, construction of joints

Traffic Control Devices: Regulatory signs, Warning signs, Traffic signals – advantages and disadvantages, Types of traffic signals and signal system, Road markings – pavement markings, Kerb markings, object markings, Traffic islands, Road intersections, Grade separated intersections, Parking facilities

Highway Maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works, Maintenance of W.B.M. roads, Bituminous surfaces and cement concrete pavements, Strengthening of existing pavements

Highway Drainage : Importance, Surface drainage, Sub-surface drainage

Text books:

1. Principles of Transportation Engineering, Chakroborty P. and Das A., Prentice Hall of India, 2003
2. Transportation Engineering: An Introduction, Khisty and Lall, 3rd Edition, Prentice Hall, 2003

Reference books:

1. Highway Engineering, Wright P. H. and Dixon C., 7th Edition, John Willey, 2004
2. Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 1st Edition, John Willey, 2008
3. Transportation Engineering and Planning, Costas P. and Prevedouros, 3rd Edition, Prentice Hall, 2001
4. Principles of Highway Engineering & Traffic Analysis, Mannering F. L., Walter P. K. and Scott John, 3rd Edition, Willey, 2004

CE605 - ESTIMATING AND COSTING

Teaching scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 3hrs.

Modes of Measurement and units of measurement as per IS1200, Types of Estimate, Various methods of estimate, Specification, purpose and principles of specification writing, Types of specification.

Cost Building up: purpose and principles, importance of schedule of rates in cost estimates, Rate analysis, factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost.

Cost and Quantity Estimate: Detailed Estimate, Forms used, Detailed estimates of various civil engineering structures, Working out quantities of various materials required for construction. Earth work estimates in roads including hill road.

Cost Accounting, various methods, classification of cost, direct and indirect charges, distribution of overheads, MAS account, issue rate of store accounts.

Valuation: Purpose of valuation, value and cost, market value, potential value, sentimental value, scrap value etc. Net and gross return, Free hold and lease hold property, Sinking fund, Depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building.

Organization of construction industry, Govt. organization, PWD organization, site administration, , BOT, Role of Government department as a construction agency, Arranging contract works, methods of carrying out works, Contracts, types of contracts, Tender documents, Indian contract law and Engineering contracts, land acquisition, Act, Legal aspects of various contract provision.

Text Books:

1. Estimating and Costing in Civil Engineering, Theory and Practice, Datta B.N., 23rd Edition, UBS Publisher, New Delhi, 2003
2. Estimating Building Cost, Popescu C. M., Phaobunjong Kan and Nuntapong Ovararin Dekker Publication

Reference Book

1.Estimating and Costing, Patil B. S., Oriental Longmans Publication, New Delhi
2.National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New Delhi

CE606- MINOR PROJECT

Teaching Scheme: 02 P **Total = 02** **Credit : 2**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

Students should conduct a detailed survey for five to seven days period in a survey camp at a suitable site for a civil Engineering Project for Data collection & analysis, related Design and submit the report and related drawings based on the project. Any one of the following group project may be selected:

1.**Irrigation Project**: Tank basin survey, contour map, area-capacity curve
2.**Water Supply Project**: Data collection for water requirement, selection of source, design of intake fixing alignment of rising main and profile leveling, design of rising main, selection of site for treatment plant, block contouring for treatment plant, fixing alignment of pure water rising main and profile leveling, fixing the location of ESR and block contouring of the site, survey for distribution network, design of distribution of network
3.Sewerage system project: Data collection for sewage quantity, fixing alignment of sewers and profile leveling, design of sewers, selection of site for sewage treatment plant, block contouring for treatment plant, preliminary design
4.**Bridge Project:** Hydrological Data collection for project, fixing the location of bridge, River survey at bridge site, preliminary design of bridge.
5. **Road Project:** Road project of 1 km length including contouring, fixing alignment, design of curves, road geometric design, estimating quantity and cost of project.

CE 607 DESIGN OF STEEL STRUCTURES -LAB

Teaching Scheme: 02 P Total = 02 **Credit : 1**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire content of the course) from the list or otherwise.

A Lab report & Structural drawings (using AutoCAD & manually) for the following

1. Design of different structural elements(simple /built up)
2. Design of a single storey industrial structure.

Field visit on Steel Structure / Industrial Building / Railway Station / Bridges / Plate girders and submission of the report.

Practical Examination:
Practical examination shall consist of oral examination based on Lab Report

CE608 - GEOTECHNICAL ENGINEERING – II- LAB

Teaching Scheme: 02 P Total = 02 **Credit : 1**
Evaluation Scheme: Internal = 25; External = 25 **Total Marks: 50**

List of Experiments:

1. To identify the subsoil strata by conducting soil resistively / seismic refractivity method.
2. To determine the soil characteristic by conducting standard penetration test / static cone penetration test.
3. To determine the bearing capacity of soil by conducting standard penetration test.
4. To determine the bearing capacity by plate load test.
5. To determine the characteristic with respect to soil log bore presentation and interpretation of exploration.
6. Determining allowable bearing capacity for shallow foundation for a given data.
7. Design of a pile foundation for a given data.
8. Determination of earth pressure by graphical method.
9. Slope stability analysis by graphical method.
10. Design of raft foundation for a given data.
11. Field visit to construction site where work is at foundation level or for field test

A Lab Report based on above experiments shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE609- TRANSPORTATION ENGINEERING -I– LAB

Teaching Scheme: P - 02 Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

List of Experiments:

1. Aggregate crushing strength test.
2. Los Angeles abrasion test / Deval abrasion test.
3. Aggregate impact test.
4. Aggregate Shape test – Flakiness index and elongation index determination.
5. Aggregate Bitumen adhesion test
6. Penetration test on bitumen.
7. Ductility test on bitumen.
8. Viscosity test on bitumen.
9. Softening point test on bitumen,
10. Flash and fire point test on bitumen.
11. Determination of Marshall Stability Value.

A Lab Report based on above experiments shall be submitted by each student.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

CE610 - ESTIMATING AND COSTING - LAB

Teaching Scheme: P - 02 Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

A Lab Report based on following shall be submitted by each student.

1. Specification for TEN items (Building works –6 items, road work –2 items, irrigation work –2 items).
2. Detailed estimate of a building, single storied with minimum four rooms with flat roof (Given problem)
3. Detailed estimate of road of minimum 1 km length with hot mix coat.
4. Detailed estimate of any two of the following: a) Septic tank for a colony b) R.C.C framed structure residential building c) Culvert
5. Analysis of Rates for EIGHT items.
6. Problem of valuation of existing residential building.
7. Submission of detailed estimate of building using Qe-Pro software.
8. Tender documents for the problem no 2

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report.

GOVT. COLLEGE OF ENGINEERING, AMRAVATI

B. TECH. (CIVIL)
III and IV Semester
CURRICULUM

Department of Civil Engineering
2009-10

Govt. College of Engineering, Amravati
Department of Civil Engineering

Third Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE301	Mathematics-III	4	1	-	5	10	15	15	60	-	-	100	5
CE302	Strength of Materials	4	1	-	5	10	15	15	60	-	-	100	5
CE303	Engineering Geology	2	-	-	2	4	8	8	30	-	-	50	2
CE304	Construction Materials	2	-	-	2	4	8	8	30	-	-	50	2
CE305	Building Construction	4	-	-	4	10	15	15	60	-	-	100	4
CE306	Fluid Mechanics-I	3	1	-	4	10	15	15	60	-	-	100	4
CE307	General Profeciency-I	-	-	2	2	-	-	-	-	50	-	50	1
CE308	Strength of Materials-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE309	Engineering Geology - Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE310	Building Construction -Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE311	Fluid Mechanics-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	19	3	10	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE303 and CE 304 for which the ESE duration will be 2 hrs.

Fourth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE401	Economics & Humanities	4	0	-	4	10	15	15	60	-	-	100	4
CE402	Water Resource Engg-I	3	1	-	4	10	15	15	60	-	-	100	4
CE403	Fluid Mechanics II	4	1	-	5	10	15	15	60	-	-	100	5
CE404	Concrete Technology	3	1	-	4	10	15	15	60	-	-	100	4
CE405	Surveying I	4	1	-	5	10	15	15	60	-	-	100	5
CE406	General Profeciency-II	-	-	2	2	-	-	-	-	50	-	50	1
CE407	Fluid Mechanics II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE408	Concrete Technology-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE409	Surveying I-Lab	-	-	4	4	-	-	-	-	50	50	100	2
	Total	18	4	10	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min.

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Fifth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE501	Theory of Structure I	4	1	-	5	10	15	15	60	-	-	100	5
CE502	Design of Reinforced Concrete Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE503	Geotechnical Engineering -I	4	1	-	5	10	15	15	60	-	-	100	5
CE504	Surveying II	3	1	-	4	10	15	15	60	-	-	100	4
CE505	Building Design & Drawing	2	0	-	2	10	15	15	60	-	-	100	2
CE506	Computer Application in Civil Engineering-Lab	-	-	2	2	-	-	-	-	50	-	50	2
CE507	Design of Reinforced Concrete Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE508	Geotechnical Engineering -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE509	Surveying II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE510	Building Design & Drawing-Lab	-	-	4	4	-	-	-	-	25	25	50	2
	Total	16	4	12	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE502 and CE505 for which the ESE duration will be 3 hrs.

Sixth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE601	Design of Steel Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE602	Geotechnical Engineering -II	4	1	-	5	10	15	15	60	-	-	100	5
CE603	Environmental Engineering-I	4	0	-	4	10	15	15	60	-	-	100	4
CE604	Transportation Engineering-I	3	1	-	4	10	15	15	60	-	-	100	4
CE605	Estimating & Costing	3	1	-	4	10	15	15	60	-	-	100	4
CE606	Minor Project	-	-	2	2	-	-	-	-	25	25	50	2
CE607	Design of Steel Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE608	Geotechnical Engineering -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE609	Transportation Engineering-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE610	Estimating & Costing-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	17	4	10	31							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except courses CE601 and CE 605 for which the ESE duration will be 3 hrs.

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Seventh Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE701	Elective -I	3	1	-	4	10	15	15	60	-	-	100	4
CE702	Theory of Structure -II	3	1	-	4	10	15	15	60	-	-	100	4
CE703	Construction Management	3	1	-	4	10	15	15	60	-	-	100	4
CE704	Water Resource Engg. -II	3	1	-	4	10	15	15	60	-	-	100	4
CE705	Environmental Engg-II	3	1	-	4	10	15	15	60	-	-	100	4
CE706	Project & Seminar	-	-	4	4	-	-	-	-	50	-	50	3
CE707	Elective -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE708	Theory of Structure -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE709	Water Resource Engg. -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE710	Environmental Engg-II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	15	5	12	32							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except course CE702 for which the ESE duration will be 3 hrs.

Eighth Semester

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE801	Elective -II	3	1	-	4	10	15	15	60	-	-	100	4
CE802	Elective -III	3	1	-	4	10	15	15	60	-	-	100	4
CE803	Advance Structural Design	3	1	-	4	10	15	15	60	-	-	100	4
CE804	Transportation Engg-II	3	-	-	3	10	15	15	60	-	-	100	3
CE805	Project & Seminar	-	-	4	4	-	-	-	-	100	100	200	9
CE806	Elective -II-Lab	-	-	2	2	-	-	-	.	25	25	50	1
CE807	Elective -III-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE808	Advance Structural Design-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	12	3	10	25							750	27

Note: The ESE duration for all cources shall be 2 hrs. 30 min. except course CE 803 for which the ESE duration will be 3 hrs.

Govt. College of Engineering, Amravati
Department of Civil Engineering

Sr. no.	Elective I	Sr. no.	Elective II	Sr. no.	Elective III
1	Structural Dynamics	1	Earthquake Resistant Design	1	Adv. Hydraulic Structures
2	Advance Geotechnical Engineering	2	Adv. Structural Analysis	2	Adv. Design of Steel Structure
3	Matrix Analysis of Structures	3	Pavement Design & Construction	3	Finite Element Methods
4	Water Treatment Process & Technology	4	Adv. Waste Water Treatment	4	Ground Improvement Technology
5	Traffic Engineering & Control	5	Adv. Foundation Engineering	5	GIS & Remote Sensing
6	Advance Hydraulics	6	Adv. Construction Management	6	Environmental Pollution & Soild Waste Management

CE301 - MATHEMATICS-III

Teaching Scheme : 04 L + 01 T Total = 05 **Credits: 05**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Linear Differential Equations with constant coefficients:

General solution to L.D.E. of n^{th} order with constant coefficients, rules for finding C.F., General method for finding P.I., P.I. of some standard functions, Method of Variation of Parameters, Cauchy's and Legendre's L.D.E.

Applications of L.D.E. to deflection of beam, bending moments, shear force, vibrations of Springs, Projectile motion.

Partial Diff. Equations:

Definition, formation of P.D.E., complete solution of PDE, Linear and non-linear PDE of types (i) f(p, q)= 0, (ii)f(p, q, z)= 0, (iii)f(p, q, x, y)= 0,(iv)f(p, q, x, y, z)= 0 ie Lagrange's form Pp+Qq=R and Clairaut's form z = px + qy + f(p, q), (v)Equations reducible to above forms. Complete solution of PDE of first and second order by method of separation of variables.

Laplace Transform:

Definition, standard formulae and properties of LT., Laplace Transform of unit step and periodic functions. Laplace Transform of unit impulse function, Inverse Laplace Transform, Convolution Property, Application of LT to solve LDE with constant coefficients.

Numerical Methods:

a) Solution of system of linear equations by Crout's method,Gauss Siedal method.
b) Numerical solution of ordinary differential equations: Picard's method, Taylor's series method, Modified Euler's method, Runge Kutta method.

Statistics :

Correlation : coefficient of Correlation, lines of regression, Curve fitting by least square method. Probability distribution Binomial, Poisson & Normal

Text Books:

1. A Text Book of Applied Mathematics Vol. I and Vol. II, Wartikar P. N. and Wartikar J. N. , Pune Vidyarthi Griha Prakashan ,Pune.
2. Higher Engineering Mathematics, Grewal B., S., Khanna Publication, 2001

Reference Books:

1. Advance Engineering Mathematics, Erwin Kreyzig, 9th Edition, John Wiley Publication
2. Advanced Engineering Mathematics, Wylie C.R., McGraw Hill Publications, New Delhi.
3. Advanced Engineering Mathematics, Peter V.O'Neil, 5th Edition, Thomson Brook/cole, Singapore.
4. Advanced Engineering Mathematics, John bird, 5th edition, Elsevier publication.

CE302-STRENGTH OF MATERIALS

Teaching Scheme : 04 L + 01 T Total = 05 Credits: 05
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Mechanical properties: Concept of direct, bearing and shear stresses and strains , stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel and concrete, Generalized Hook's law, factor of safety.
Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.
Axial force, shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.
Stresses in beams (Bending, Shear):
i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.
ii) Shear: Distribution of shear stresses on beam cross sections,
iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.
Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.
Thin cylinders: Thin cylinders subjected to internal pressures.
Theories of elastic failure: Introduction to theories of elastic failure
Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.
Combined direct & bending stresses: Combined direct and bending stresses, applications to short columns with eccentric loads, retaining walls with horizontal lateral force.
Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by a) Macauley's method b) Moment Area method c) Conjugate Beam method.
Columns: Theory of long columns, Euler, Rankine and Secant formula

Text Books:

1. Engineering Mechanics of Solids, E.P. Popov, 2nd Edition, Prentice Hall of India, 1998
2. Mechanics of Materials, Beer, Johnston and DeWolf, 3rd Edition, Tata McGraw Hill Publication, New Delhi, 2002.

Reference Books:

1. Mechanics of Materials, Gere and Timoshenko, 2nd Edition, CBS publishers, 2002

2. Mechanics of Solids in Introduction, Laudner T.J. and Archer R.R., McGrawHill International Editions, 1994.
3. Theory and Problems of Strength of Materials, William A. Nash, 3rd Edition, Schaum's Outline Series, McGraw Hill International Editions, 1994.

CE303 – ENGINEERING GEOLOGY

Teaching Scheme : 02 L + 00 T Total = 02 Credits: 02
Evaluation Scheme: 08 CT1 + 08 CT2 + 04 TA + 30 ESE Total Marks: 50
Duration of ESE: 2hrs.

Different branches of Geology and importance of geology in Civil Engineering.
Mineralogy: - Study of common rock forming and ore minerals, with reference to its physical properties.
Petrology: - Rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.
Structural Geology: - Outcrop; dip strike, elementary ideas about folds, joints and unconformity, effect of these structures in foundation.
Earthquakes Engineering: - Earthquake waves, causes and effects, magnitudes and intensity, earthquake zones of India, seismic coefficient.
Geological Investigation: - Surface and sub-surface investigation, direct and indirect.
Rock: Rock as a material of construction. Study of engineering properties of rocks and soils. Geological studies related to site selection for dam and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields, etc. case histories of some major projects of tunnels, dams and reservoirs.

Text Books:
1. General & Engineering Geology, Parbin Singh, 6th Edition, Kataria S. K. Sons, 2001.
2. Engineering Geology, Goodman, R.E., John Wiley and Sons, NY, 1993.

Reference Books:
1. Geology of India, Wadia D.N., 4th ed. Tata McGraw Hill, , New Delhi, 1978
2. Geology of India, Krishan M.S., 5th ed., CBS Publishers,, New Delhi, 1982.
3. Geology for Engineers, Blyth, F.G.H. and de Freitas, M.H., ELBS, 1994.
4. Geology for Civil Engineers, McLean, A.C. and Gribble, C.D., 3rd Edition, Unwin Hyman, London, 1988.

CE304 - CONSTRUCTION MATERIALS

Teaching Scheme : 02 L + 01 T Total = 03 Credits: 02
Evaluation Scheme: 08 CT1 + 08 CT2 + 04 TA + 30 ESE Total Marks: 50
Duration of ESE: 2hrs.

Building stones: Qualities of good building stones, Common building stones, their properties and uses, Dressing of stone, Selection of stone for different Civil works
Bricks: Manufacture of bricks, Qualities of good bricks, Field and laboratory tests on bricks, Classification of bricks.
Concrete blocks: Types-solid and hollow, common dimensions, manufacture of blocks, uses
Lime: Classification of lime and their uses in construction works, Slaking of lime-different methods,
Mortars: Ingredients and their functions, Types of mortars and their suitability, Preparation of mortar, Proportion of mortars used for different works
Timber and wood based products: Structure of timber, Characteristics of good timber, Chief varieties of timber and their uses in construction, Market forms of timber and their uses in construction, Industrial timber products-veneer, veneer ply wood, particle board, fiber board, batten board, block board, lamin board, laminates, advantages and uses of processed timber
Fixtures and fastenings of doors and windows: Hinges-types and uses, Bolts-types and uses, Handles and locks, Nails and screws
Glass: Constituents, Properties, Types of glasses, their characteristics, market forms, uses in construction.
Metals & alloys:
Mild steel: Constituents, properties, Market forms of mild steel-round bars, flats, plates, pipes, Indian standard rolled steel sections, uses
Aluminum: Properties, advantages, market forms, uses, anodizing of aluminum
Cast iron: Constituents, properties, uses
Copper: Properties and uses, alloys of copper and their uses
Composite panels- uses
Gypsum and allied product: composition, properties and uses, Market forms-plaster boards, blocks and tiles, Plaster of Paris
Plastic: Classification, properties, uses, market forms, P.V.C. floor tiles, laminated plastic, plastic sheets, plastic panels, P.V.C. pipes, P.V.C. roofing sheets, Fiber reinforced plastic sheets.
Ceramic products: Ceramic sanitary appliances-water closets, urinals, traps, wash basins, sinks, their common sizes, stone ware pipes & fittings, Glazed ceramic tiles
Flooring tiles: Types-plain cement tiles, Mosaic tiles, chequred tiles, ceramic tiles, glazed tiles, P.V.C. flooring tiles, manufacture of mosaic flooring tiles
Paints Enamels and varnishes: Types, Composition, characteristics and uses, covering power of paint
Miscellaneous materials
Asbestos: Properties and uses, A.C. roofing sheets-types and dimensions, A.C pipes

Insulating materials: Sound & heat insulating materials, Common forms -their properties and uses

Adhesives
Water proofing compounds- suitability and uses
Termite proofing chemicals

Text Books:

1. Building Materials , P.C. Verghese, Prentice-Hall of India, New Delhi
2. Civil Engineering Materials, T.T.T.I. Chandigarh , Tata Mc-Graw Hill Publishing Co., New Delhi

Reference Books:

1. A Text Book of Building Materials, Amargit Aggarwal and N.L. Arora, New India Publishing House, New Delhi
2. Civil Engineering Materials, Duggal A. K., TMH Publication.
3. Building Construction, Mckey, Volumes 1-8
4. Building Materials Technology, Brantly, Tata McGraw Publication

CE305 - BUILDING CONSTRUCTION

Teaching Scheme : 04 L + 00 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

BUILDING COMPONENETS
Introduction: Building-definition as per IS, Types of building as per National Building Code, Components of buildings and their functions, Types of structures-load bearing, framed and composite structures, their suitability, relative advantages and disadvantages
Foundation: Definition, purpose, Loads acting on foundation, Safe bearing capacity of soil-definition, values from IS code, Methods of improving bearing capacity of soil, Types of foundation-shallow foundation & deep foundations for buildings- spread footings for walls and columns, combined footing for columns, raft foundation, Black cotton soil-characteristics, problems in construction, precautions to be taken, Foundations in black cotton soil-under reamed pile foundations, Failure of foundation- causes, Setting out for foundation
Beams and Column: Types and positioning
Floors & Floor finishes: Floors- Definition & purpose, Types of R.C.C. floors, their suitability and construction procedure, Types of flooring-suitability and construction procedure
Doors & Windows: Doors-Purpose, Criteria for location, Sizes, Types of door frames, Methods of fixing door frames, Types of door shutters-ledged-braced & battened, fully

paneled, flush, louvered, glazed, Other types of doors and their suitability-sliding, revolving, rolling shutter, collapsible door, grilled door

Windows-Purpose, Criteria for location, Sizes, Types of wooden windows-casement, louvered, glazed, Metal windows, Aluminum windows, Corner & bay windows, Ventilators-purpose and types, Grills for windows

Lintels and Arches: Lintels-purpose, types and their suitability, details of R.C.C. lintel, Arches- types

Stairs: Function, Technical terms, Criteria for location, Requirements of good stair, Types of stairs and their suitability, Principle of stair design, Lifts, Ramps, Escalators

Roofs: Flat & pitched roofs-suitability, Types of steel roof trusses and their suitability, Placing and fixing trusses, Types of roofing sheets, Fixing of roofing sheets to trusses

CONSTRUCTION PROCESSES

Masonry construction:

Stone masonry: Materials required, Technical terms, Principles to be observed during construction, Commonly used types and their suitability, Construction procedure

Brick Masonry: Materials required, Technical terms, Principles to be observed during construction, Commonly used bond and their suitability, Construction procedure, defects in brick masonry, Strength of brick masonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction procedure

Concrete block masonry: Materials required, Construction procedure

Composite masonry: Types, advantages, applications, Materials required, Construction procedure

Plastering and pointing: Purpose, Types and their suitability, Procedure of plastering and pointing, Defects in plastering work

Coloring & painting: Procedure of painting old and new masonry surfaces, metal surfaces and wooden surfaces

Damp proofing: Causes and effects, Methods of damp proofing, materials required, Details of cavity wall construction

Sound proofing: Factors affecting acoustical design of an auditorium, Various methods, Materials required

Fire proofing: Points to be observed during planning and construction, Fire protection requirements of a multistoried building, fire escape elements, fire proofing of building elements

Termite proofing: Methods, procedure

Joints in structure: Construction joints-necessity, provision of construction joint in slab, beam and columns, Expansion joints –necessity, location, materials used, details of expansion joints and foundation and roof level for a load bearing and framed structure

Formwork & scaffolding: Form work-types and suitability, Period for removal of formwork, Scaffolding: Necessity, Types, Details of erections

Text Books:

1. Fundamentals of Building Construction, Materials and Methods, Allen Edward and Lano Joseph, 4th Edition, John Wiley Publication.
2. A Text Book of Building Construction, Sharma and Kaul, Schaum Series, TMH

Reference Books:

1. National Building Code of India 2005, B.I.S , Techniz Books International, New Delhi.
2. Building Materials & Components, C.B.R.I., (2005), Tata Mc-Graw Hill Publishing Co. New Delhi

CE306 - FLUID MECHANICS – I

Teaching Scheme : 03L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Introduction: Fluid & Fluid Mechanics, Applications in Civil Engineering, Physical properties of fluids-mass density, unit weight, specific gravity, compressibility, bulk modulus, capillarity, surface tension, viscosity, Newton's law of viscosity, Dynamic and kinematics viscosity, classification of fluids

Fluid Statics: Hydrostatic law, pressure at a point, Pascal's law, Pressure head, Atmospheric pressure, Absolute and gauge pressure, total pressure and center of pressure, Pressure diagram, Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves.

Buoyancy and Floatation: Buoyant force and center of buoyancy, Archimedes Principle, Principle of floatation, Metacenter and metacentric height, Equilibrium of floating bodies,

Fluid kinematics: Types of flow-steady & unsteady, uniform & non-uniform, laminar & turbulent, one, two & three dimensional, rotational & irrotational, compressible and incompressible, Reynold's experiment and Reynolds number, Euler's approach of describing fluid motion- Velocity and acceleration, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluid flow

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation, assumption and limitations, kinetic energy correction factor, different forms of energy heads, loss of head, Modified form of Bernoulli's theorem, Energy gradient line and Hydraulic gradient line, Impulse momentum equation, momentum correction factor.

Flow through pipes: Characteristics of turbulent flow through pipes, Velocity distribution in turbulent flow, Major losses and minor losses, Darcy Weisbach equation, Factor affecting friction factor, Coefficient of friction for commercial pipes, roughening of pipes with age, Moody's diagram, Flow through simple pipes, pipes in series, pipes in parallel, siphons pipes, Equivalent pipes, Water hammer in pipes-causes, effects & remedial measures, Transmission of power through pipe flow

Uniform Flow through channel: Types of channels, Geometrical properties of prismatic channel section, types of flow through channel, Characteristics of uniform flow through prismatic channel, Chezys equation, Mannings equation, Mannings constant for different types of channel surfaces, Economical channel section, Conditions for rectangular & trapezoidal economical channel section, Specific energy of flow, Specific force and

specific discharge, specific energy diagram, critical depth, criteria for critical depth, subcritical, critical and supercritical flow, Froud No.
Flow measurements:
Velocity measurements: Pitot tube- basic principle of working, types, measurement of velocity of flow in pipes and channel, Current meter-types and working, Floats-types
Discharge measurement for pipes: Venturimeter-principle, equation for discharge, orifice plate meter

Discharge measurement for channels: Notches-Types, Discharge over rectangular notch, triangular notch, trapezoidal notch, Cippolletti notch, End contraction and velocity of approach, Francis formula, Weirs- discharge over broad crested weir, Flumes-Venturiflume and Parshall flume-working principle and computation of discharge, River gauging by segment method
Discharge measurement for tanks: Orifice-types, flow through circular sharp crested orifice, hydraulic coefficient, time required to empty tank by orifice, Mouthpiece-types, flow through external cylindrical mouthpiece (submerged & free)

Text Books:

1. Theory & Applications of Fluid Mechanics, Subramanya K., Tata McGraw Hill, 1st Edition , 2001
2. Fluid Mechanics, V.L. Streeter E.B. and Wylie, 9th edition, McGraw Hill Book Co., 1998.

Reference Books:

1. Flow in Open Channels, K.G. Rangaraju, Tata McGraw Hill Publication Co. Ltd., New Delhi, 1993.
2. Principles of Fluid Mechanics, Alexandrou, 1st Edition , Prentice Hall, 2001
3. Fluid Mechanics; with Engineering Application, R.L. Daugherthy, J.B. Franzini, E.J. Finnermore, McGraw Hill International Edition, 1989.
4. Essentials of Fluid Mechanics, John M. Cimbala & Yunus A. Cengel, 1st Edition, McGraw Hill, 2008.

CE307 GENERAL PROFECIENCY I

Teaching Scheme: 02 P Total = 02 **Credit : 1**
Evaluation Scheme: Internal = 50 **Total Marks: 50**

Word study: synonym, antonym, meanings, matching works, adjectives, adverbs, prefix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension overran unseen passage,
Most commonly spoken sentences: Introduction to Neuro Linguistic Programming. Verbal communication, its significance, types of written communication, organization of a text. (Titles summaries, headings, sequencing, signaling, cueing etc.), important text

factors (length of paragraph, sentences, words, clarification and text it selectivity and subject content.
Non verbal communication, types of graphics and pictorial devises, body language.

Text Books:

1. Communication skill by Leena Sen, Printice Hall of India, 2000
2. Basic Communication Skills for Technology, Rutherfoord, 2/e Pearson Education India , 2001

Reference Books:

1. Communicate to Win, Kogan Page , 2006
2. Communication at Work: Principles and Practices for Business and the Professions, Adler, Ronaold B, 6th Edition., McGraw Hill, 1999
3. Communication Skill, John Bench, John Wiley & Sons, 1992
4. Effective communication for Professionals and Executives, Bowbrick, P., Graham & Trotman, 1988

CE308-STRENGTH OF MATERIALS-LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

The Lab consists of 8 experiments from part A, while part B is compulsory

List of Experiments:
Part A-

1. Tension test on mild steel
2. Test on tor steel (tension, bend and rebend)
3. Compression test on metals
4. Compression test on Wood
5. Shear test on metals.
6. Impact test on metals
7. Hardness test on metals
8. Torsion test on metals
9. Deflection of beams.
10. Modulus of rupture test.
11. Buckling of columns
12. Deflection of springs.

Part B: At least four problems from four different units of syllabus to be solved using either programming or spreadsheet or solvers or any software.

CE309 – ENGINEERING GEOLOGY – LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

List of Experiments

1. Megascopic study of common rock forming and ore minerals.
2. Megascopic study of the common igneous, sedimentary and metamorphic rocks.
3. Geological map reading and construction of selections from simple geological
4. Maps with engineering problems (about 8 maps)

A Lab Report based on above practical shall be submitted by each student.
Practical examination shall be based on practical and viva voce conducted on the above syllabus.

CE310- BUILDING CONSTRUCTION – LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

List of Experiments

1. Sketch book containing following free-hand sketches
   - i) Different types of foundations
   - ii) Different types of R.C.C. Floors
   - iii) Line diagrams of different types of steel roof trusses
   - iv) Different types of stairs (plan and elevations)
   - v) Types of stone masonry (elevations)
   - vi) Types of bonds in brick masonry –plan and elevation of stretcher & header bond, 1 brick thick wall in English and Flemish bond, brick columns
   - vii) Expansion joints at foundation and roof level in load bearing and framed structure
   - viii) Any one type of scaffolding (elevation and section)
   - ix) Form work for R.C.C. floor
   - x) Section of typical load bearing and framed structure
2. Drawing of following building components on half imperial drawing sheet
   - i) Details of fully paneled/flush door and glazed window, indicating dimensions
   - ii) Design of layout of R.C.C. dog-legged stair and its drawing (plan and section)

iii) Details of steel roof truss along with roof covering and fixing at support

iv) Preparation of setting-out plan for foundation from given line plan of a two-room building

3. Setting out in field for foundation of building from the plan in sheet no. 4

Practical Examination;

Practical examination shall consist of oral examination based on Lab Report.

CE311 - FLUID MECHANICS –I-LAB

Teaching Scheme: 02 P Total = 02 Credit : 1
Evaluation Scheme: Internal = 25; External = 25 Total Marks: 50

List of Experiments

1. Reynolds experiment-study of laminar and turbulent flow, determination of Reynolds No.
2. Study of floating bodies-determination of metacentric height, type of equilibrium
3. Study of Bernoulli's theorem-drawing EGL & HGL, determination of losses
4. Calibration of Venturimeter /Orifice plate meter
5. Determination of hydraulic coefficients of orifice/mouthpiece
6. Determination of friction factor/coefficient of friction for pipes of different diameter/materials
7. Determination of minor losses in pipes fittings (Elbow / bends / valves / reducers / taper)
8. Calibration of rectangular/triangular notch
9. Study of uniform flow through prismatic channel-determination of Chezy's / Manning's constant

Lab Report:

Lab Report shall consist of the detailed report on experiments conducted and studied.

Practical Examination:

Practical examination shall consist of oral examination based on Lab Report

CE401 - ECONOMICS AND HUMANITIES

Teaching Scheme : 04 L + 00 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

ECONOMICS:-

Nature and Scope of Economics: Special significance of economics to engineers
Production: Factors of Production, Laws of return, Various Economics system, Forms of Business organization.
Banking: Function of Central and Commercial Banks
Taxation: Principal of taxation, Direct and Indirect taxes
Market: Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly
Economics of Development: Meaning, Characteristics of under development, obstacles to economic growth and vicious circle of poverty
Economic planning: Meaning, objective and salient features of current five years plan of India
Planning horizons, life structuring the alternatives
Economics of comparison of different alternative projects.

HUMANITIES:
Salient features of Indian Constitution, Fundamental rights and Duties, Directive Principles of State Policy
Indian parliament: Composition and powers, President of India, election and powers, Council of Ministry and Prime Ministers
Impact of science and Technology on Culture and Civilization.
Human Society: Community Groups, Social Control: Meaning, Types and Agencies, marriage and Family: Functions, Types and Problems.

Text Books:
1. Human Society, Davis K, McMillan Co., New York, 1961.
2. Elementary Economic Theory, Dewett and Varma J. D, Publisher S. Chand & Co, New Delhi
3. Constitutional Govt. in India, Pylee M. V, S. Chand & co, New Delhi.

Reference Books:
1. The Constitution of India, Joshi G. N., MacMillan India Ltd.
2. Principles of Sociology, Maclaver and Page.
3. Economics: An Introduction to its Basic Principles, Mitra, J. K., Word Press Pvt. Ltd.
4. Engineering Economics, Reggs J.L.., McGraw Hill Co., 1976.

CE402 - WATER RESOURCES ENGINEERING – 1

Teaching Scheme : 03 L + 01 T Total = 04 Credits: 04
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

ENGINEERING HYDROLOGY:-
Definition and its importance, hydrological cycle, Hydrologic equation.
Precipitation :- Forms, Types , factor affecting, measurement, rain gauge network, estimation of missing data, consistency of data, mean area precipitation, brief introduction of intensity- duration-Frequency relationship and artificial rain.
Evaporation: - Process, factor affecting, measurement and estimation, control of evaporation.
Evapo-transpiration- factor affecting, measurement and estimation
Infiltration: - Process, factor affecting, measurement, infiltration indices,
Run off: - Factor affecting, estimation of runoff, rainfall- runoff correlation
Flood:- Flood classification, importance, estimation of flood, flood control techniques, brief description of flood. Routing. Channel flow routing.
Hydrographs- Typical flood control hydrograph, base flow separation, depression storage, overland flow, unit hydrograph, s-curve hydrograph. Synthetic unit hydrograph.

IRRIGATION ENGINEERING:-
Irrigation: Necessity, advantages & disadvantages of irrigation, suitability of soil, standards of irrigation water.
Minor Irrigation works: - Necessity and general layout of Bandhara and percolation tank
Lift Irrigation: - Necessity and general layout, main components.
Crop Water Requirements: - Principal Indian crop seasons and their CWR, Duty and Delta, Consumptive used of water, irrigation methods and their efficiencies. Comparative study of different irrigation methods, sprinkler and drip irrigation methods
Ground Water: - Ground and surface water resources, aquifer parameters, specific yield and specific capacity, Well hydraulics for steady flow condition, safe yield and yield tests.
Water Logging: - causes, control, preventive and curative measures, reclamation of alkaline and saline lands, drainage system design.
Water Harvesting**:-** Definition, Necessity, water harvesting potentiality, elements of typical water harvesting system, methods of water harvesting and cost of water harvesting.

Text Books:

1. Water Resources Systems Planning and Management, Chaturvedi M. C., Tata McGraw Hill,1987
2. Irrigation, Zimmerman J.D, John Wiley and Sons., New York, 1966

Reference Books:

1. Hydrology, Subramanyam K, 2nd Edition, Tata McGraw Hill, 2003.

2. Hydrology: Water Quantity and Quality Control, Todd David Keith , Mays Larry W., 2nd Edition, John Wiley and Sons., New York, 2004.
3. Handbook of Hydrology, Chow, Y. T., McGraw Hill, 1988
4. Ground Water by Raghunath H. M., 2nd edition, Wiley Eastern Ltd. New Delhi, 1983.

CE403- FLUID MECHANICS –II

Teaching Scheme : 04 L + 01 T Total = 05 **Credits: 05**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Flow around immersed objects: Practical problems involving flow around immersed objects, Drag and lift-definition & expression, Types of drag, Pressure drag on flat plate, cylinder and sphere, Stream line & bluff bodies

Laminar flow: Relation between shear stress and pressure gradient, Steady laminar flow through circular pipes, Hagen-Poiseuille law (no derivation), Laminar flow between parallel plates, Laminar flow through porous media

Boundary layer theory: Definition, Thickness of boundary layer, Nominal, momentum, displacement and energy thickness, Factors affecting boundary layer, Development of boundary layer along long thin plate, Laminar, turbulent and transitional boundary layer, laminar sub-layer, Boundary layer on rough surface, Total drag due to laminar & turbulent boundary layer, Hydrodynamic ally smooth and rough boundaries, Separation of boundary layer and its control.

Non-uniform flow through channel: Types of non-uniform flow, Gradually varied flow (GVF) and rapidly varied flow (RVF), Equation of GVF and its alternative solutions, Classification of channel bed slopes, Various GVF profiles, their characteristics and field examples, Rapidly varied flow, Hydraulic jump- definition, location, practical examples of its occurrence, Analysis of hydraulic jump in rectangular channel-relation between conjugate depths, energy dissipation, Classification of jumps, Practical applications of hydraulic jump

Model investigations: Dimensions of physical quantities, Dimensional homogeneity, Buckingham's π theorem for dimensional analysis, Uses and limitations of dimensional analysis, Model study-similitude, Types of similarities, Types of forces acting on structures, Force ratios, Non-dimensional numbers and their significance, Model laws and their applications for model studies of hydraulic structures, Distorted and undistorted models, Scale effects

Impact of jet - Impact of jet on plane and curved surfaces (stationary and moving), Moment of momentum equation, Force exerted by jet on symmetrical and unsymmetrical moving curved vanes when jet striking tangentially at the tip, Force exerted by jet on series of vanes and radial curved vanes

Pumps: Definition and types and suitability,

Centrifugal pump: Components and their functions, principle, working, priming, efficiency and power required, net positive suction head, limit of suction head, Multistage pumps, pumps in series, Installation and operation of pumps

Reciprocating pumps: Components and their functions, principle, working, efficiency and power required, Air vessels, indicator diagrams

Modern Pumps: Deep submersible pumps- Components and working, Jet pumps, turbine pumps

Hydraulic turbines: Elements of hydroelectric power generation power plant, Surge tank-function, location and classification, Hydraulic turbines-definition, Heads and efficiencies, Classification based on various criteria, Choice of turbine, Specific speed and its significance, Unit speed, unit power, Unit discharge Pelton wheel turbine and Francis turbine – suitability, components and their functions, work done, power and efficiency

Text Books:

1. Hydraulics and Fluid Mechanics, Modi and S.M. Seth, Standard Book House, New Delhi.
2. Fluid Mechanics, White F. M., 5th Edition, McGraw Hill International Publication, 2003.

Reference Books:

1. Fluid Mechanics, V.L. Streeter E.B. and Wylie, McGraw Hill Book Co., 1983.
2. Fluid Mechanics with Engineering Application, R.L. Daugherthy, J.B. Franzini, E.J. Finnermore, McGraw Hill, International Edition, 1989.
3. Fluid Mechanics with Engineering Applications, E. John Finnemore and Joseph B. Franzini, 10th Edition , McGraw Hill, 2002
4. Essentials of Fluid Mechanics, John M. Cimbala and Yunus A. Cengel, 1st Edition, McGraw Hill, 2008

CE404 - CONCRETE TECHNOLOGY

Teaching Scheme : 03 L + 01 T Total = 04 **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Ingredients of Concrete:

Cement: Various types of cement, Chemical Composition of Portland Cement, Manufacture of Portland Cement, Properties of Cement, Laboratory Tests.

Aggregate: Classification of Aggregate, Physical Properties, Bulking and Moisture Content, Specific Gravity, Bulk Density, Laboratory Tests

Water: Impurities in Water and Their Effects on Properties of Concrete.

Admixtures: Various Types of Admixtures and Their Functions.

Proportioning of Concrete Mixes: Introduction of Mix Design, Basic Consideration in Concrete Mix Design, Factors Influencing the Choice of Mix Proportions, Methods of Concrete Mix Design with special emphasis on IS Code Method And IRC-44 Method.

Production of Concrete: Batching of Materials, Mixing, Transportation and Placing of Concrete, Compaction of Concrete, Curing of Concrete.

Properties of Fresh Concrete: Workability of Concrete, Factor Affecting Workability, Measurement of Workability.

Properties of Hardened Concrete: Strength of Concrete, Stress-Strain Characteristics, Shrinkage and Temperature Effect, Creep, Permeability and Durability of Concrete.
Inspection, Testing And Quality Control of Concrete: Inspection, Testing of fresh Concrete, Factors causing Variation in Quality of Concrete, Field Control, Advantages of Quality Control, Testing of Hardened Concrete (NDT Methods).
Special Concretes and Concreting Techniques: Light Weight Concrete, Fiber-Reinforced Concrete, Roller Compacted Concrete, High Strength Concrete, Vacuum Concrete, Ferro Cement.
Guniting, Grouting and Shotcreting Concrete.
Repair For Concrete Structures: Repair of Cracks, Repair and Strengthening of Columns, Beams And Slab, Leak Sealing.

Text Books:

1. Concrete Technology, Neville A. M. and Brooks J. J., Pearson, 1987
2. Concrete Technology, Gambhir M L, 3rd Edition, Tata McGraw Hill, New Delhi, 2003

Reference Books:

1. Lea's Chemistry of Cement and Concrete, Lea F M, Edward, Elsevier, 2003.
2. Properties of Concrete, Neville A M, 4th Edition, Pearson, 1995.
3. Concrete, Mindess Sidney, Young J. Francis and Darwin David, 2nd Edition, Prentice Hall, 2002.
4. Design of Concrete Mixes, Krishna Raju, 4th Edition, CBS Publishers, 2000.

CE405 - SURVEYING-I

Teaching Scheme : 04 L + 01 T Total = 05 — Credits: 05
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE — Total Marks: 100
Duration of ESE: 2hrs.30 min.

Introduction: Surveying- Necessity & purpose, Classification of survey, principles of surveying, Basic measurements in surveying, work of surveyor
Linear Measurements and offsets: Instruments for measurement of distance, linear measurements, errors in measurements, corrections to field measurements, Instruments for marking stations, ranging out, direct and indirect ranging, Chaining on sloping ground, offsets for locating details, degree of accuracy of offsets, Instruments for setting right angle, obstacles in chaining & ranging, Cross staff survey
Chain & Compass surveying : Selection of survey stations, Survey lines, Bearing of a line, fore bearing, back bearing & reduced bearing, Prismatic compass 7 Surveyors compass – its use & adjustment, local attraction, magnetic declination & its variation, calculation of included angles from bearing
Chain & compass traversing- Open & closed traverse, reconnaissance, fixing of stations, Booking field notes, Plotting of traverse survey, adjustment of traverse by Bowditch's graphical method,

Plane table surveying: Introduction, use, advantages & disadvantages, accessories required, principle of plane table surveying, orientation of plane table, methods of orientation, methods of plane table surveying, two point & three point problems.
Leveling : Technical terms, principle of leveling, Bench mark & its types, Instruments used for leveling, dumpy level, tilting level, automatic level, Digital level, Temporary & permanent adjustments, leveling staffs and its types, precautions in leveling, booking of field readings in field book, calculation of RL by using height of collimation method & rise & fall method. Arithmetic check, Classification of leveling-reciprocal, leveling difficulties, Errors and mistakes in leveling, correction for curvature & refraction, Transfer of data from digital level to PC software.
Profile Leveling: Fixing alignment, L-section & Cross section, selection of scales & plotting, fixing formation level
Contouring: Definition, characteristics, contour interval, methods of locating contours, interpolation of contours, contour maps & its uses, counter drawing

Computation of Area & volume: Plannimeter- theory, zero circle, digital plannimeter, computation of area, Computation of Volume by mean area method, trapezoidal rule, prizmoidal formula, volume of earth work from contour plan, capacity of a reservoir

Theodolite: Component parts of transit Theodolite, Micro optic theodolite, fundamental lines temporary adjustment, measurement of horizontal angles by repetition & reiteration method, measurement of vertical angles, deflection angles, magnetic bearing, lining in by Theodolite, balancing in by Theodolite, prolonging a straight line, laying off horizontal angle, use of Theodolite as a level, Use of Distomat for measuring distances
Total station: Introduction, components, adjustments, various uses,

Text Books:

1. Surveying & Leveling, Basak N., 1st Edition , Tata McGraw Hill, 2004
2. Surveying Vol. I and II, Duggal S.K., 2nd Edition , Tata McGraw Hill, IInd, 2004

Reference Books:

1. Surveying & Leveling Practice, Anderson J. M. and Mikhail E. M., 7th Edition, McGraw Hill, 1998
2. Surveying Principles and Applications, Kavanagh, 7th Edition, Prentice Hall, 2007
3. Surveying Fundamentals & Practices, Nathanson, Lanzafama and Kissam, 5th Edition, Prentice Hall, 2006
4. Surveying, Moffitt and Bossler, 10th Edition, Prentice Hall, 1998

CE 406 - GENERAL PROFECIENCY - II

Teaching Scheme: 02 P Total = 02 **Credit : 1**
Evaluation Scheme: Internal = 50 **Total Marks : 50**

Specific format for written communication like business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day to day written communication like application, notices, minutes, quotations, orders, enquiries etc.
Oral communications – important objectives of interpersonal skills, (verbal and non verbal), face to face communications, group discussion and proposal interviews. Methodology of conduction of meetings, seminars, symposia, conferences and workshops.

Assignment on

1. NLP workshop Part I
2. NLP workshop Part II
3. Ice breaking
4. Interview rehearsal
5. Communication practice I
6. Communication practice II
7. Body language I
8. Body language II

Text Books:

1. Communication skill, Leena Sen, Printice Hall of India, 2000
2. Basic Communication Skills for Technology, Rutherfoord, 2/e Pearson Education India , 2001

Reference Books:

1. Communicate to Win, Kogan Page , 2006
2. Communication at Work: Principles and Practices for Business and the Professions, Adler, Ronaold B, 6th ed., McGraw Hill, 1999
3. Communication skill, John Bench, John Wiley & Sons, 1992
4. Communication skill Revised, Prasad P., S.K. Kataria & Sons , 2000
5. Effective communication for professionals and executives, Bowbrick, Peter, Graham & Trotman, 1988

CE407- FLUID MECHANICS –II-LAB

Teaching Scheme: 02 P   Total = 02   Credit : 1
Evaluation Scheme: Internal = 25; External = 25   Total Marks: 50

List of Experiments

1. Study of reciprocating pumps- determination of efficiency
2. Study of Centrifugal pumps- determination of efficiency
3. Study of Pelton wheel turbine - component parts and their functions, working, determination of efficiency.
4. Study of Francis turbine - component parts and their functions, working, determination of efficiency
5. Study of hydraulic jump in laboratory tilting flume- determination of conjugate depths, length of jump, loss of head
6. Calibration of laboratory Venturiflume
7. Study of non-uniform flow in prismatic channel
8. Study of Modern Pumps such as Jet pumps, submersible pumps, Turbine pumps- their characteristics, collection of monograms/performance characteristics/

Lab Report:

Lab Report shall consist the detailed report on experiments conducted and studied.

Practical Examination:
Practical examination shall consist of oral examination based on Lab Report

CE408 - CONCRETE TECHNOLOGY-LAB

Teaching Scheme: 02 P   Total = 02   Credit : 1
Evaluation Scheme: Internal = 25; External = 25   Total Marks: 50

- Minimum 8 experiments mentioned below shall be performed by each student.
- A Lab Report on experiments conducted shall be submitted by each student. Practical examination shall be viva voce based on the practical and syllabus of the course.

List of Experiments-

1. Fineness of cement
2. Soundness of cement
3. Consistency of cement

4. Setting time of cement
5. Compressive strength of cement
6. Sieve analysis of aggregate (fine and coarse)
7. Bulking of sand
8. Silt content of sand
9. Workability of concrete: slump test
10. Workability of concrete: compaction factor test
11. Workability of concrete: flow table test
12. Mix design by IS method (compulsory)
13. Compressive strength of concrete
14. Study of NDT methods for concrete

CE409 - SURVEYING-I -LAB

Teaching Scheme: 04 P   Total = 04   Credit   : 2
Evaluation Scheme: Internal = 50; External = 50   Total Marks: 100

List of Experiments-

1. Distance measurement by chain & tape including ranging
2. Chaining and offsetting
3. Measurement of bearing by prismatic compass
4. Cross staff survey
5. Chain & compass traversing (plotting of traverse on A1 size sheet)
6. Plane table surveying (plotting of traverse on A1 size sheet)
7. Use of Dumpy level and auto level for simple & differential levelling
8. Use of digital level for levelling
9. Profile leveling for minimum 500 m length (Plotting of L-section & cross section of road on A1 size sheet)
10. Block contouring for minimum 200x200 m area (Plotting of contour map on A1 size sheet)
11. Measurement of area by plannimeter
12. Use of Theodolite for measurement of horizontal angles by different methods
13. Use of Theodolite for measurement of deflection angle and vertical angles
14. Use of Theodolite for measurement of magnetic bearing, prolonging straight lines, lying off horizontal angles.
15. Use of Micro-optic theodolite for measuring horizontal and vertical angles.
16. Use of Total station for measurement of distances, angles and levels.

Lab Report:

1. Field book containing the records of data related with all practical
2. Drawing on Full imperial size sheets for following :
   - i) Chain and compass survey
   - ii) Plane table surveying
   - iii) Profile leveling
   - iv) Block countering

Practical Examination

Practical examination shall consist of practical performance for a given problem in field and viva voce based on Lab Report

Govt. College of Engineeering, Amravati
Department of Civil Engineering

EQUIVALENCE OF THE COURSES FOR REVISED CURRICULUM
B. Tech. Civil Engineering II Year

S.N.	**Course Code**	**Title of Course**	**Course Code**	**Title of Course**
1	CE301	Mathematics-III	SHU301	Engineering Mathematics-III
2	CE302	Strength of Materials	CEU303	Strength of Materials
3	CE303	Engineering Geology,	CEU301	Engineering Geology & Hydrology
	CE402	Water Resource Engg-I		
4	CE304	Construction Materials,	CEU304	Building Construction & Materials
	CE305	Building Construction		
5	CE306	Fluid Mechanics-I	CEU302	Fluid Mechanics
6	CE307	General Profeciency-I	SHU205	General Profeciency-I
7	CE308	Strength of Materials-Lab	CEU307	Strength of Materials Lab
8	CE309	Engineering Geology - Lab	CEU305	Engineering Geology & Hydrology Lab
9	CE310	Building Construction -Lab	CEU308	Building Construction & Materials Lab
10	CE311	Fluid Mechanics-I-Lab	CEU306	Fluid Mechanics Lab
11	CE401	Economics & Humanities	CEU401	Engineering Economics & Humanities
12	CE403	Fluid Mechanics II	CEU405	Open Channel Flow & Hydraulic Machines
13	CE404	Concrete Technology	CEU404	Concrete Technology
14	CE405	Surveying I	CEU403	Surveying
15	CE406	General Profeciency-II	SHU305	General Proficiency II
16	CE407	Fluid Mechanics II-Lab	CEU409	Open Channel Flow & Hydraulic Machines Lab
17	CE408	Concrete Technology-Lab	CEU408	Concrete Technology Lab
18	CE409	Surveying I-Lab	CEU407	Surveying Lab
19	CE604	Transportation Engineering-I	CEU402	Transportation Engineering
20	CE609	Transportation Engineering-I-Lab	CEU406	Transportation Engineering Lab

Note:

1) All students to third year with some backlog courses shall remain in old shceme (212 credits).
2) All students to who failed in second year (DC students) shall be transferred to new shceme (184 credits).

Improtant note for * courses:

i) These courses of old scheme shall be offered during the academic year (2011-12) including summer term for backlogger students.

ii) In the academic year 2012-13 and onward all students shall register for courses as per revised curriculum (new scheme)

iii) If DC student has passed any one subject out of CE303 and CE402 then option shall be given to a student to register and pass the other course as per old curriculum to claim exemption in CEU301 or register the course CEU301 as per revised curriculum.

iv) If DC student has passed any one subject out of CE304 and CE305 then option shall be given to a student to register and pass the other course as per old curriculum to claim exemption in CEU304 or register the course CEU304 as per revised curriculum.

Department of Civil Engineering

EQUIVALENCE OF THE COURSES FOR REVISED CURRICULUM
M. Tech. Structural Engineering Full Time

S.N.	Course Code	Title of Course	Course Code	Title of Course
1	SE101	Engineering Mathematics	SHP101	Engineering Mathematics
2	SE102	Theory of Plates & Shells	CEP101	Theory of Plates & Shells
3	SE103	Computer Methods of Structural Analysis	CEP102	Computer Methods of Structural Analysis
4	SE104	Advanced Structural Analysis	CEP103	Advanced Structural Analysis
5	SE105	Theory of Elasticity and Plasticity	CEP104	Theory of Elasticity and Plasticity
6	SE106	Lab. Practice-I #	CEP105	Lab. Practice-I #
7	SE107	Seminar-I*	CEP106	Seminar-I*
8	SE201	Finite Element Method	CEP201	Finite Element Method
9	SE202	Advanced Design of Steel and R.C. Structures	CEP202	Advanced Design of Steel and R.C. Structures
10	SE203	Structural Dynamics	CEP203	Structural Dynamics
11	SE204	Elective-I A) Prestressed Concrete	CEP204	Elective-I A) Prestressed Concrete
12	SE204	Elective-I B) Structural Stability	CEP204	Elective-I B) Structural Stability
13	SE204	Elective-I C) Experimental Stress Analysis	CEP204	Elective-I C) Experimental Stress Analysis
14	SE205	Elective-II A) Earthquake Resistant Structures	CEP205	Elective-II A) Earthquake Resistant Structures
15	SE205	Elective-II B) Design of Environmental Structures	CEP205	Elective-II B) Design of Environmental Structures
16	SE205	Elective-II C) Soil-Structure Interaction	CEP205	Elective-II C) Soil-Structure Interaction
17	SE206	Lab Practice-II##	CEP206	Lab Practice-II##
18	SE207	Seminar-II **	CEP207	Seminar-I **
19	SE301	Dissertation (Phase-I) & Seminar	CEP301	Dissertation (Phase-I) & Seminar
20	SE401	Dissertation (Phase-II)	CEP401	Dissertation (Phase-II)

Department of Civil Engineering

EQUIVALENCE OF THE COURSES FOR REVISED CURRICULUM

M. Tech. Environmental Engineering Full Time

S.N.	Course Code	Title of Course	Course Code	Title of Course
1	EV101	Environmental Science and Chemistry	CEP111	Environmental Science and Chemistry
2	EV102	Environmental Microbiology & Biological Processes	CEP112	Environmental Microbiology & Biological Processes
3	EV103	Advanced Water Treatment	CEP113	Advanced Water Treatment
4	EV104	Advanced Wastewater Treatment	CEP114	Advanced Wastewater Treatment
5	EV105	Solid & Biomedical waste Management	CEP115	Solid & Biomedical waste Management
6	EV106	Environmental Engineering Laboratory-I #	CEP116	Environmental Engineering Laboratory-I #
7	EV107	Seminar-I*	CEP117	Seminar-I*
8	EV201	Air Quality Monitoring & Control	CEP211	Air Quality Monitoring & Control
9	EV202	Industrial Wastewater Treatment	CEP212	Industrial Wastewater Treatment
10	EV203	Environmental Impact Assessment & Management	CEP213	Environmental Impact Assessment & Management
11	EV204	Elective-I A) Hazardous Waste management	CEP214	Elective-I A) Hazardous Waste management
12	EV204	Elective-I B) Environmental Statistics	CEP214	Elective-I B) Environmental Statistics
13	EV204	Elective-I C) Environmental Geotechnology	CEP214	Elective-I C) Environmental Geotechnology
14	EV205	Elective - II A) Environmental System Modeling,	CEP215	Elective - II A) Environmental System Modeling,
15	EV205	Elective - II B) Water and Wastewater Engineering Structures	CEP215	Elective - II B) Water and Wastewater Engineering Structures
16	EV205	Elective - II C) Water Distribution systems and Optimization	CEP215	Elective - II C) Water Distribution systems and Optimization
17	EV206	Environmental Engineering Laboratory-II ##	CEP216	Environmental Lab Pracitce - III
18	EV207	Seminar-II**	CEP217	Seminar II
19	EV301	Dissertation (Phase-I) & Seminar	CEP311	Dissertation (Phase-I) & Seminar
20	EV401	Dissertation (Phase-II)	CEP411	Dissertation (Phase-II)

Department of Civil Engineering

EQUIVALENCE OF THE COURSES FOR REVISED CURRICULUM
M. Tech. Environmental Engineering Part Time

S.N.	Course Code	Title of Course	Course Code	Title of Course
1	EV151	Environmental Science and Chemistry	CEP131	Environmental Science and Chemistry
2	EV152	Solid & Biomedical waste Management	CEP132	Solid & Biomedical waste Management
3	EV153	Advanced Water Treatment	CEP133	Advanced Water Treatment
4	EV154	Environmental Lab Pracitce-I	CEP134	Environmental Lab Pracitce - I
5	EV251	Environmental Microbiology & Biological Processes	CEP231	Environmental Microbiology & Biological Processes
6	EV252	Advanced Wastewater Treatment	CEP232	Advanced Wastewater Treatment
7	EV253	Environmental Impact Assessment & Management	CEP233	Environmental Impact Assessment & Management
8	EV254	Environmental Lab Pracitce-II	CEP234	Environmental Lab Pracitce - II
9	EV255	Seminar-I	CEP235	Seminar I
10	EV351	Industrial Wastewater Treatment	CEP331	Industrial Wastewater Treatment
11	EV352	Elective-I A) Hazardous Waste management	CEP332	Elective-I A) Hazardous Waste management
12	EV352	Elective-I B) Environmental Statistics	CEP332	Elective-I B) Environmental Statistics
13	EV352	Elective-I C) Environmental Geotechnology	CEP332	Elective-I C) Environmental Geotechnology
14	EV353	Elective - II A) Environmental System Modeling,	CEP333	Elective - II A) Environmental System Modeling,
15	EV353	Elective - II B) Water and Wastewater Engineering Structures	CEP333	Elective - II B) Water and Wastewater Engineering Structures
16	EV353	Elective - II C) Water Distribution systems and Optimization	CEP333	Elective - II C) Water Distribution systems and Optimization
17	EV354	Environmental Lab Pracitce-III	CEP334	Environmental Lab Pracitce - III
18	EV355	Seminar-II	CEP335	Seminar II
19	EV451	Air Quality Monitoring & Control	CEP431	Air Quality Monitoring & Control
20	EV452	Environmental Lab Pracitce -IV	CEP432	Environmental Lab Pracitce - IV
21	EV453	Dissertation (Phase I) & Seminar	CEP433	Dissertation (Phase I) & Seminar
22	EV551	Dissertation (Phase-II) & Seminar	CEP531	Dissertation (Phase-II) & Seminar
23	EV651	Dissertation (Phase-III)	CEP631	Dissertation (Phase-III)

Department of Civil Engineering

EQUIVALENCE OF THE COURSES FOR REVISED CURRICULUM
M. Tech. Geotechnical Engineering Part Time

S.N.	Course Code	Title of Course	Course Code	Title of Course
1	GT151	Advance Soil Mechanics	CEP142	Advanced Soil Mechanics
2	GT152	Advance Foundation Engineering	CEP143	Advanced Foundation Engineering
3	GT153	Ground Improvement Technology	CEP243	Ground Improvement Techniques
4	GT154	Geotechncial Lab Pracitce - I	CEP144	Geotechncial Lab Pracitce - I
5	GT251	Soil Dynamics and Machine Foundation	CEP241	Soil Dynamics and Machine Foundation
6	GT252	Earth Dam Analysis And Design	CEP242	Earth Dam Analysis And Design
7	GT253	Rock Mechanics	CEP441	Elective - II (B) Rock Mechanics
8	GT254	Geotechncial Lab Pracitce - II	CEP244	Geotechncial Lab Pracitce - II
9	GT255	Seminar I	CEP245	Seminar I
10	GT351	Finite Element Methods	CEP341	Finite Element Methods in Geotechnical Engineering
11	GT352	Engineering with Geosynthetics	CEP342	Geosynthetics
12	GT353	Elective - I - 1. Geoenvironmental Engineeirng	CEP343	Elective - I A. Geoenvironmental Engineeirng
13	GT353	Elective - I- 2. Soil Structure Interaction	CEP343	Elective - I- B. Soil Structure Interaction
14	GT353	Elective - I -3 Construction Methods in Geotechnical Engineering	CEP343	Elective - I -C Construction Methods in Geotechnical Engineering
15	GT354	Geotechncial Lab Pracitce - III	CEP344	Geotechncial Lab Pracitce - III
16	GT355	Seminar II	CEP345	Seminar II
17	GT451	Elective - II 1.Geotechnical Earthquake Engineering	CEP441	Elective - II A.Geotechnical Earthquake Engineering
18	GT451	Elective - II 2. Offshore Structure Engineering		**No Equivalance**
19	GT451	Elective - II 3. Pavement Analysis and Design	CEP441	Elective - II B. Pavement Analysis and Design
20	GT452	Geotechncial Lab Pracitce - IV	CEP442	Geotechncial Lab Pracitce - IV
21	GT453	Dissertation (Phase I) & Seminar	CEP443	Dissertation (Phase I) & Seminar
22	GT551	Dissertation (Phase-II) & Seminar	CEP541	Dissertation (Phase-II) & Seminar
23	GT651	Dissertation (Phase-III)	CEP641	Dissertation (Phase-III)
24		**No Equivalance**	CEP141	Computer Programming & Numerical Methods