



GOVT. COLLEGE OF ENGINEERING, AMRAVATI
DEPARTMENT OF CIVIL ENGINEERING




CURRICULUM
of
B. TECH. (Civil Engineering)

w.e.f
2019- 20
(Admitted batch)


Member Secretary
(S. W. Thakare)


Chairman, BoS
(Dr. M. N. Hedao)




Principal
(Prof. A.M. Mahalle)

[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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.


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


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B. Tech. (Civil Engineering)													
SEM -III													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			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	-	-	-	30	20	-	-	-	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			15	00	06	21	180	70	300	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

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B. Tech. (Civil Engineering)

SEM -IV													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			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 Studies	1	-	-	1	30	20	-	-	-	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	30	20	-	-	-	50	0
Total			17	00	08	24	210	90	300	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





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B. Tech. (Civil Engineering)

SEM- V													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits	
			Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			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**

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B. Tech. (Civil Engineering)

SEM - VI

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			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 and 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 and 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	180	60	360	150	100	850	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 , CEU622 and CEU624(A) for which duration shall be 3.00 hours**

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

B. Tech. (Civil Engineering)





SEM - VII

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			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	150	50	300	275	50	825	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 Except CEU721, CEU722 and CEU724(B) for which duration shall be 3.00 hours

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]			

B. Tech. (Civil Engineering)





SEM - VIII

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory			Practical			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 Except **CEU822(B), CEU823(B) and CEU823(C)** for which duration shall be 3.00 hours




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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]			

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
<ul style="list-style-type: none"> A. Structural Mechanics B. Reliability Analysis of Structures C. Geographic Information Systems and Science D. Railway, Tunnel & Airport Engineering E. Hydraulic Modeling 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> A. Computer Methods in Structural Analysis B. Masonry Structures C. Solid and Hazardous waste management D. Intelligent Transportation System E. Infrastructure Planning & Management 	<ul style="list-style-type: none"> A. Structural Dynamics B. Prestressed Concrete C. Air and Noise pollution control D. Ground Improvement Technology E. Port, Harbour and Bridge Engineering 	<ul style="list-style-type: none"> A. Finite Element Method B. Advanced Design of Concrete Structures C. Construction Project Planning & System D. Industrial Pollution and Control E. Advanced Foundation Engineering 	<ul style="list-style-type: none"> A. Earthquake Resistant Structures B. Industrial structures C. Design of Hydraulic Structures D. Pavement Design and Construction E. Geotechnical Investigation and Construction Practices F. Water Distribution System

LIST OF OPEN ELECTIVES


OPEN ELECTIVE I CEU 633	OPEN ELECTIVE II CEU 733
<ul style="list-style-type: none"> A. Introduction to Civil Engineering B. Project Management C. Construction Techniques 	<ul style="list-style-type: none"> A. Industrial Building Planning & Design B. Interior Designs and Drawing C. Environmental Legislation D. Disaster Management


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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]


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


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Equivalence of Second Yr. B. Tech Courses

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			
SHU301	Engineering Mathematics III	SHU321A	Transforms and Discrete Mathematics
CEU301	Engineering Geology and Hydrology Lab		IL#
CEU302	Fluid Mechanics	CEU321	Fluid Mechanics
CEU304	Building Construction and Materials	CEU322	Building Materials and Construction
CEU303	Strength of Materials	CEU323	Solid Mechanics
CEU308	Building Construction and Materials Lab	CEU325	Building Materials and Construction Lab
CEU305	Engineering Geology and Hydrology Lab	CEU326	IL#
CEU307	Strength of Materials Lab	CEU327	Solid Mechanics Lab
IV Semester B. Tech			
CEU405	Open Channel Flow and Hydraulic Machines	CEU421	Hydraulic Engineering
CEU403	Surveying	CEU422	Surveying
CEU402	Transportation Engineering	CEU423	Transportation Engineering
CEU404	Concrete Technology	CEU424	Concrete Technology
CEU409	Open Channel Flow and Hydraulic Machines Lab	CEU425	Hydraulic Engineering Lab
CEU407	Surveying Lab	CEU426	Surveying Lab
CEU406	Transportation Engineering Lab	CEU427	Transportation Engineering Lab
CEU408	Concrete Technology Lab	CEU428	Materials, Testing & Evaluation Lab



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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	02	-	No Equivalence	-
15	SHU401	Engineering Mathematics- IV	03	-	No Equivalence	-
16	SHU402	Engineering Mathematics Lab	02	-	No Equivalence	-
17	SHU403	Engineering Mathematics Lab	02	-	No Equivalence	-


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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	-



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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


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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



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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 Steel Structure	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	



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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 Treatment Process & 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 Lab	01	-	No equivalence	-
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 Steel Structure 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	-



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CEU808 (F)	Elective –III (F) Lab Advanced Water Treatment Process &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 (E)	Port, Harbour and Bridge Engineering	03
-	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


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SHU321A DIFFERENTIAL EQUATIONS AND PROBABILITY

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 the solution methodologies for second order Partial Differential Equations.
- II. To study applications of partial differential equations in vibration of string and heat flow.
- III. To equip students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
- IV. To introduce different sampling distributions and hypothesis tests.

Course Contents:

Laplace Transform:

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:

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:

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:


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


Text Books:

1. Higher Engineering Mathematics, S.S. Grewal, Khanna Publishers, 2020, 44th edition
2. A text book of Engineering Mathematics, .P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010


Reference Books:

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.


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5. Higher Engineering Mathematics, V, Ramana, Tata Mc Graw Hill Publishing company Ltd., Delhi, 2008, 6th edition

Course Outcomes:


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


CEU321A.1 Develop different techniques of solving partial differential equations;

CEU321A.2 Implement these techniques to evaluate the engineering problems;


CEU321A.3 .Develop techniques needed to calculate probabilities and describe the properties of discrete and continuous distribution functions;

CEU321A.4 Do analysis of statistical data with the use of statistical tests in testing hypotheses;


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SHU322A INTEGRAL CALCULUS AND PROBABILITY

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 the solution methodologies for second order Partial Differential Equations.
- II. To study applications of partial differential equations in vibration of string and heat flow.
- III. To equip students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
- IV. To introduce different sampling distributions and hypothesis tests.

Course Contents:

Ordinary differential equations of higher orders:

Linear differential equation with constant coefficient, complementary function, particular integral, complete solution; method of variation of parameters

Integral Calculus:

Beta and Gamma functions and their properties; Evaluation of double integrals (Cartesian & polar), change of order of integration.

Laplace Transform: (

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:





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:

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

Text Books:

1. Higher Engineering Mathematics, S.S. Grewal, Khanna Publishers, 2020,
2. A text book of Engineering Mathematics, .P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010

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Reference Books:


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, 8. V,Ramana, Tata McGraw Hill Publishing company Ltd., New Delhi,2008,6th edition

Course Outcomes:


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

1. **CEU322A.1:** Develop different techniques of solving partial differential equations;
2. **CEU322A.2:** Implement these techniques to evaluate the engineering problems;
3. **CEU322A.3** .Develop techniques needed to calculate probabilities and describe the properties of discrete and continuous distribution functions;
4. **CEU322A.4** Do analysis of statistical data with the use of statistical tests in testing hypotheses;


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CEU321 FLUID 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: 2 hrs. 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

Course Contents:

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

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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. I. 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


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CEU322 BUILDING MATERIALS 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 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

Course Contents:

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, Vitriified 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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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 (I & 1 1/2 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 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.
3. Building Materials and Construction, Saurabh Kumar Soni,, S. K. Kataria & and, Daryaganj, New Delhi -11000

Reference Books:

1. National Building Code of India 2005, B.I.S., 2nd revision, Techniz Books International, New Delhi,2005
2. FPA 5000: Building Construction & Safety Code, FPA, Techniz Books International, New

- Delhi, 200.
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, 11 th Edition, Standard Book House, New Delhi 2010.

Course Outcomes:

After Completion of course students will be able to:


CEU322.1 identify various types of Buildings


CEU322.2 classify basic components of building

CEU322.3 understand the importance and role of each component of building


CEU322.4 characterize and understand the use of various building materials

CEU322.5 decide suitable construction techniques/methods for various construction works


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CEU323 SOLID MECHANICS

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

Credits: 03
Total Marks: 100

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 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 $M/I = FN = E/R$

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, 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, 12th 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.
4. <https://www.youtube.com/c/drsuchitahirde/videos>

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.


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SHU323 INTRODUCTIONS TO CONSTITUTION OF INDIA

Teaching Scheme: 1 Th
Evaluation scheme: 20TA + 30 ESE
MSE Duration: 1Hr 30 Min.

Credit: 00
Total Marks: 50

Course Objectives:

To acquaint students about constitution of India, Fundamental rights, fundamental duties, electoral process and role of central, state, and local government and its administration.

Course Content

Introduction to Constitution of India

Salient features of the Constitution of India, Preamble of the Constitution, fundamental rights and fundamental duties, Directive Principles of State Policy, and relevance of directive principles. Parliamentary Form of Government in India- President, Vice-President, Prime Minister along with council of Minister, Parliament, Supreme court, Electoral process in India. Amendment Procedure.

State executives Governor, chief minister, state legislature, high courts of state,

Role and functions of local self-government- Municipalities in India, with special reference to 73rd amendment, Panchayat Raj in India with special reference to 74th amendment

Course outcomes:

On the successful completion of this course, Students shall be able to-

SHU323.1: Understand and remember the knowledge of basic information about Indian Constitution.

SHU323.2: Apply the knowledge of fundamental rights and fundamental duties.

Reference Books: -

1. An Introduction to Constitution of India, M.V. Pylee, Vikas Publishing, 2002
2. Constitution of India, Dr. B. R. Ambedkar, Government of India Publication
3. Latest Publications of Indian Institute of Human Rights, New Delhi

CEU324 ENGINEERING GEOLOGY

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 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.

Course Contents:





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 Water table, depth zone & relation between surface relief and water table; 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.

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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, 2nd Edition (2009), Macmillan Publishers India.
3. A Text Book of Engineering Geology , Dr R B Gupte, Publication :Pune Vidyarthi Gruh 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:


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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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.


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CEU325 BUILDING MATERIALS AND CONSTRUCTION LAB

Teaching Scheme: 02 P Total: 02
Evaluation Scheme: 25 ICA + 25 ESE

Credits: 01
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:

- I. 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
- II. Drawing of following building components on half imperial drawing sheet
 1. Details of fully paneled/flush door and glazed window, indicating dimensions
 2. Design of dog-legged stair from given data and its drawing (plan and section)
 3. Details of steel roof truss along with roof covering and fixing at support
 4. Preparation of setting-out plan for foundation from given line plan of a two-room building
- III. Setting out in field for foundation of building from the plan in sheet no.2(iv)
- VI. Setting out in field layout of compound wall for plot having curved corner


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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:


After the completion of the course, Students will be able to:

325.1. Explain various buildings components by drawing the free hand sketches


325.2. Prepare the detailed drawings of various building components

325.3 Set out in field, the layout of a building


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CEU-326 ENGINEERING GEOLOGY LAB

Teaching Scheme: 02 P

Total: 02

Credits: 01

Evaluation Scheme: 25 ICA + 25 ESE

Total Marks: 50

Prerequisites:

Basic knowledge about various rocks and minerals

Course 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

- I. 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, varieties 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

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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 Practical performed in Laboratory and viva-voce.


Course Outcomes:


After Completion of course students will able to:

CEU326.1: The students will get the basic knowledge about natural material like rocks and minerals and their usage as well as their availability.


CEU326.2: 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

CEU326.3: 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


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CEU 327 SOLID MECHANICS LAB

Teaching Scheme: 02 P

Total: 02

Credits: 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.

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.
12. 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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

CEU421 HYDRAULIC 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:

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.

Course Contents:





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, Chezy's equation, Manning's equation, Manning's 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- Venturi flume-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 & Frauds Model Law and their applications for model studies of hydraulic structures, Distorted and undistorted models, scale effect.

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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, Yijay 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

CEU42L.1: Apply various equations for flow through prismatic channel

CEU42L.2: Apply to the various model laws to the flow problems

CEU42L.3: Solve the problems of gradually varied flow and rapidly varied low.

CEU42L.4: Acquired knowledge of working principles of fluid machinery

CEU422- SURVEYING

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 basic concepts of surveying.
- II. To study the methods of linear and angular measurements.
- III. To use various equipment for surveying, leveling, contouring
- IV. To apply the knowledge of surveying and leveling on field.

Course Contents:

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 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.


Leveling: Bench mark & its types, Auto level, Digital level, Temporary adjustments, leveling staffs and its types, precautions in leveling, booking of field readings in field book, calculation of RL, Arithmetic checks, Reciprocal leveling, Profile leveling, difficulties, Errors and mistakes in leveling, correction for curvature & refraction.

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, 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.


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Tachometry: Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points, Use of tachometry 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 Griha Prakashan, Pune, 24th Edition, 2002
2. Surveying Vol I & II B. C. Punmia, Laxmi Publication New Delhi, 11th edition, 2008

Reference Books:

3. Surveying Vol. I by .K. Duggal, Tata McGraw Hill Publishing Company Ltd., New Delhi
4. 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

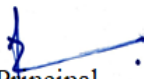
CEU422.3 Use different types of surveying and leveling equipment.

CEU422.4 Apply the knowledge of surveying and leveling on field.


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CEU423 TRANSPORTATION 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 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

Course Contents:

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 37:200 I, 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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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., Nern 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., Prentice Hall

Reference Books:

1. Transportation Engineering Vol. I & II, V. . Yazirani & S.P. Chandola, Khanna Publishers, New Delhi, 2003
2. Transportation Engineering: An Introduction, Khisty and Lall, Prentice Hall, 2003
3. Bridge Engineering, Ponnuswamy, S., Tata McGraw Hill Publication, New Delhi, 2007
4. Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 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:

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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

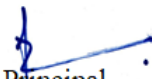
CEU423.4: Design the Highway pavement

CEU423.5: Understand the functions of various components of bridge and carry out hydraulic design of bridge.


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CEU424 CONCRETE 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 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 Contents:

Ingredients of Concrete

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.

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.

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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: Fibre 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. evil le, 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 + 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 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

Course Contents:

Introduction to Hydrology: Hydrological cycle, Precipitation-forms and types, : Infiltration, Evaporation, Transpiration, Evapotranspiration, 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:

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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, I994.

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


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SHU 422 ENVIRONMENTAL STUDIES

Teaching Scheme: 01 L + 00 T Total: 01

Credits: 00

Evaluation scheme: 20TA + 30ESE

Total Marks: 50

MSE Duration: 1Hr 30 Min.

Course objectives:

- I. Be aware of various environmental factors and their preservation.
- II. Teach them how to protect Environment and natural resources.
- III. How to make equitable use of energy resources.

Course Content

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, Need for public awareness.

Social issues and Environment: From Unsustainable to sustainable development, urban problems related to energy, Water conservation, rainwater harvesting, and watershed management Resettlement and rehabilitation of people, problems.

Environmental ethics: Issues and possible solution, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, Consumerism and Waste products, Environment protection act, Air (prevention & control) act, Water (prevention and control) act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation.

Human population and environment: Environment and human health, Human rights, Role of Information Technology in Environment and human health, Public awareness.

Natural Recourses: Conventional energy resources: definition, classification, composition, energy content types: coal, petroleum, natural gases, hydro geothermal, nuclear, environmental implication of energy uses. Non-conventional energy resources: solar energy, wind energy, tidal energy, geothermal energy, hydropower and biogas.

Ecosystem and Biodiversity: Concept of ecosystem, Structure and function of ecosystem, Producer, consumer, decomposers. Energy flow in the ecosystem, Ecological succession, Food chains, food webs, and ecological pyramids, Introduction, types, characteristic features, structure and function of following ecosystem: Forest ecosystem, Grass land ecosystem, Desert ecosystem Aquatic ecosystem (Rivers and ocean).

Introduction- definition: genetics, species, and ecosystem, diversity.

Biogeographically classification of India, Conservation of biodiversity- In-situ and Ex-situ conservation of Biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts, Endangered and endemic species of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national, and local level, India as mega diversity nation. Hot spot of biodiversity

Environmental Pollution: Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste, Management, Causes effects and control measures, Role of individual in prevention of pollution, Hazardous waste management, Biomedical waste management, Disaster management: floods, earthquake, cyclone and landslides.

Reference Books:

1. The Biodiversity of India, Bharucha Erach ,Marin Publishing Pvt. Ltd., Ahmedabad
2. Brunner R.C., 1989,Hazardous Waste Incineration, McGraw Hill Inc.
3. Marine pollution, Clark R.S., Clanderson Press Oxford (TB)
4. Environmental Chemistry, De A.K. Wiley Estern Lmt.
5. Environmental Chemistry, Sharma B.K., 2001 Goel Publ., House, Meerat.
6. Environmental Management, Wagner K.D., 1998, W.B. Saunders Co., Philadel phia, USA
7. Environmental Studies, Benny Joseph, 1st edition,2005,Tata Mcgraw-Hill Publ.

Course outcomes:

After studying the course, the students will be able to:

SHU422.1: Convey the Environmental awareness among peoples.

SHU422.2: Apply Conservation of various natural resources and environmental factors.

SHU422.3: Aware about social and environmental issues.

CEU 426 HYDRAULIC ENGINEERING LAB

Teaching Scheme: 02 P

Total: 02

Credits: 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 CEU42 I) 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 intimal 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


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CEU427- SURVEYING LAB

Teaching Scheme: 02 P

Total: 02

Credits: 01

Evaluation Scheme: 25 ICA + 25 ESE

Total Marks: 50

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 A I size sheet.
3. Plane table surveying for survey of a given area and plotting of features on ground on A I size sheet.
4. Profile leveling for minimum 500 m length and Plotting of L-section & cross section of road on A I size sheet.
5. Block contouring for minimum 200x200 m area and Plotting of contour map on A I size sheet.
6. Measuring horizontal angles, vertical angles, deflection angles, magnetic bearing, prolonging straight lines, lying off horizontal angles by Theodolite.
7. Computation of horizontal distances and elevations by tachometry for horizontal and inclined sites
8. 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 Practicals.

PRACTICAL EXAMINATION

Practical examination shall consist of practical performance for a given problem in field and viva voce based on term work.

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Course Outcomes:


After completion of course the students will be able to:-

CEU427.1: Understand the importance and scope of surveying in any engineering project.


CEU427.2: Apply the principles of surveying and use conventional and advanced surveying instruments for surveying.

CEU427.3 Execute a survey Project.


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CEU428 TRANSPORTATION ENGINEERING LAB

Teaching Scheme: 02 P

Total: 02

Credits: 01

Evaluation Scheme: 25 ICA + 25 ESE

Total Marks: 50

Course 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 Practical:

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:

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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:


After completion of course the students will be able to:-

CEU428.1: understand basic concepts of highway material testing


CEU428.2: decide the suitability of Coarse Aggregates and Bitumen for Road construction

CEU428.3: determine CBR value and using it in the design of flexible pavement


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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 I, 3, 6 and 8 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 sand 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.

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

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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.

SHU425 HUMAN VALUES AND ETHICS

Teaching Scheme: 1 Th
Evaluation scheme: 20TA + 30 ESE
MSE Duration: 1Hr 30 Min.

Credit: 00
Total Marks: 50

Course Objectives:

- I. To develop the importance of moral virtue through spiritual and yoga activities which lead to professional experience of students
- II. To understand the dimensions of professional ethics
- III. To learn engineering ethics through theories which develop moral judgment among technical students
- IV. To understand the global ethical issues and its dimension which leads to moral leadership

Human Values

Morals, values and Ethics, Integrity, Work ethic, Service learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Character, Spirituality, Introduction to yoga and meditation for professional excellence and stress management.

Professional Ethics

Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

Engineering Ethics

Senses of 'Engineering Ethics', Variety of moral issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Models of professional roles, Theories about right action, Self-interest, Customs and Religion, Uses of Ethical Theories





Global Issues

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Moral Leadership, Code of Conduct, Corporate Social Responsibility

Text books:

1. "Ethics in Engineering", Mike W. Martin and Roland Schinzinger, Tata McGraw Hill, New Delhi, 2003.
2. "Engineering Ethics", Govindarajan M, Natarajan S, Senthil Kumar V. S, Prentice Hall of India, New Delhi, 2004.

Reference books:

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

Course Outcomes:


After completion of the course, the student shall be able to


SHU425.1: Make work life balance and found him or her with sound mindset at workplace.

SHU425.1 Incorporate professional ethics at workplace

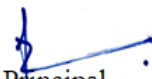
SHU425.1 Manage moral dilemmas and conflicts at workplace

SHU425.1 Develop global perspective for ethical issues


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CEU521 THEORY OF STRUCTURES

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

Credits: 03
Total Marks: 100

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:

3. Basic Structural Analysis, Reddy C. S, 3rd edition, Tata McGraw Hill, New Delhi, 2004.
4. 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/>
4. <https://www.youtube.com/c/drsuchitahirde/videos>

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

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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

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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/>


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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

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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 overflow 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:

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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

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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,

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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, design 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, Hirde S. K , Hedao M. N., Narosa Publishing House, 2023
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.
4. Design of Steel Structures: Limit State, N. Subramanian, Oxford University Press, India, 2018

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/>
11. <https://www.youtube.com/c/drsuchitahirde/videos>

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

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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 leveling equipment:

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

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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

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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 code 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 Modeling (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

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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

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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,

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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

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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 leveling 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 leveling along the given alignment for a road using digital level and Plotting the profile of the alignment surveyed
2. Transferring leveling data to computers and developing and printing leveling 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

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- 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:

- 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 leveling;

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:

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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://www.youtube.com/c/drsuchitahirde/videos>
14. <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 ESTIMATION AND 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

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

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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):

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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 principle, 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


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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
7. <https://www.youtube.com/c/drsuchitahirde/videos>

Course outcomes:

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

CEU623(A).1: solve the problem related to plastic analysis of steel structure;

CEU623(A).2: apply Concept of shear centre to field problem;

CEU623(A).3: analyse the beam curved in plan;

CEU623(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, Cornell 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

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Course Outcomes:

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

CEU623(B).1: apply the knowledge of reliability analysis of structures in civil engineering;

CEU623(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


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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:

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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

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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

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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:




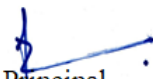
After completion of this course, students will be able to:

- 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 Outcomes	Program 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

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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 acquainted 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 Modeling:

Basics of Hydraulic Modeling, similarity mechanics, model laws, distinction between numerical and hydraulic models, classification of hydraulic modeling, materials used in the model, scale effect, design, construction, operation and interpretation of the results; Role of instrumentation and data processing;

Gravity dominated models:

Modeling 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 modeling


Hybrid and Analogue models;

Scope and limitations of hydraulic modeling, complementary aspects of numerical and hydraulic modeling


Text Books:

1. Hydraulic Modeling – 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.


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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 modeling;

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

Evaluation Scheme: 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, Hirde S. K, Hedao M. N., Narosa Publishing House, 2023
2. Designs of Steel Structures, Raghupati, 1st Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi
3. Design of steel Structures, Arya AS, and Ajmani J.L., Nem Chand & Brothers, Roorkee

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4. BIS 800-2007, “Code of practice for general construction in steel”, BIS New Delhi
5. BIS 875-1987 (Part I to V), “Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures”, BIS, New Delhi
6. <https://www.youtube.com/c/drsuchitahirde/videos>

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 Siddiqui, 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, Hindered 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, Flootation: 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,


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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:

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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:




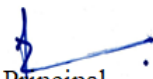
Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU624(C).1	2	2	1	1	2	2	2	1	2	2	2	2	2	2	2
CEU624(C).2	2	3	2	2	2	2	2	2	3	3	2	2	2	1	2
CEU624(C).3	3	3	3	2	3	2	2	2	3	3	2	2	2	2	2

0- Not correlated

1 - Weakly Correlated

2- Moderately Correlated

3- Strongly Correlated

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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:

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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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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:

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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


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OPEN ELECTIVES I

CEU633(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 harbor

Basics of Environmental Engineering: Water treatment systems, waste water treatment, solid waste management

Basics of water resources Engineering:

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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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

CEU633 (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 acquaint 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

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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

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CEU633(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

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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:




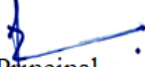
On completion of the course, students will be able to:

- 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

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<i>[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]</i>			

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

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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 ESTIMATION 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 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) 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


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Principal
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- Collecting minimum 3 tender notices for Civil Engineering works and drafting a tender notice from given data

PART II:

- Study of Qe-Pro software/ Bentley 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):




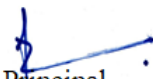
On completion of the course, students will be able to:

- 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

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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)

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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:

CEU630(B).1: execute various tests on various types of concrete;

CEU630(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

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CEU630(C) PHYSICO-CHEMICAL PROCESSES FOR WATER TREATMENT LAB

Teaching Scheme: 02 P

Evaluation Scheme: 25 ICA + 25 ESE

Credits: 01

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.

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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.

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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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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 locator
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:

CEU630(E).1: apply destructive, partial destructive and Non-Destructive Testing techniques to field problems.

CEU630(E).2: perform various destructive, partial destructive and Non-Destructive Testing techniques to assess the quality of concrete

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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

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CEU631 MINOR PROJECT

Teaching Scheme: 02 P
Evaluation Scheme: 25 ICA

Credits: 01
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 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 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.

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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,
- iv) knowledge /skill acquired
- v) Presentation of results

Course Outcomes:

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

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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

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: 3 hrs.

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. To introduce 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

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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/videos>

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

1- Not correlated

1 - Weakly Correlated

2- Moderately Correlated

3- Strongly Correlated

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CEU722 FOUNDATION ENGINEERING

Teaching Scheme: 03 L + 00 T Total: 03

Evaluation Scheme: 30 MSE + 10 TA +60 ESE

Duration of ESE: 3 hrs.

Credits: 03

Total Marks: 100

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, Pressure meter 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

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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's method

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, and methods 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 field 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	0
CEU722.2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU722.3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU722.4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU722.5	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

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PROGRAM ELECTIVE III

CEU723(A) COMPUTER METHODS IN STRUCTURAL ANALYSIS

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:

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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 McGraw 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

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CEU723(B) MASONRY STRUCTURES

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

Credits: 03
Total Marks: 100

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, cavity wall, 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

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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(3rd revision) BIS, New Delhi
5. Seismic Design of reinforced concrete and Masonry Buildings, Paulay T. 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


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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 waste management.
- II. To make the students familiar conversant with design & optimize techniques for solid & hazardous waste management.
- III. To impart students knowledge on specialized solid & hazardous waste treatment.
- IV. To make the students familiar with policies and legal implications of solid and hazardous wastes.

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 solid wastes

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

Disposal of Solid waste: Materials separation and processing, thermal conversion, biological and chemical conversion, recycling and reuse of municipal solid wastes, land filling, composting, gas generation, closure of landfills, design of landfills

Industrial solid waste composition, biodegradable, non-biodegradable, hazardous, toxic solid wastes, methods of detoxification, disposal on land





Hazardous wastes: Origin, sources and types of hazardous, infectious and Bio-medical wastes in municipal solid wastes, quality parameters

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

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

Text Books:

- 1 Integrated Solid Waste Management, G. Tchobanoglous, H. Theisen and S. A. Vigil, McGraw Hill Education (Indian Edition), (ISBN: 9789339205249/9339205243)
- 2 Hazardous Waste Management, M. D. LaGrega, P. L. Buckingham and J. C. Evans, Waveland Press Inc., (ISBN: 978-1577666936/1577666933)

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- 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 Management Issues, G. Tchobanoglous, H. Theissen and R Eliassen, McGraw-Hill Book Company, (ISBN: 9780070632356)
- 3 Solid Waste Management, D. J. Hagerty, J. L. Pavoni and J. E. Heer (Jr.), Van Nostrand Reinhold Co., 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

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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:

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

Reference Books:

2. Intelligent Transportation Systems by Paolo Pagano
3. Intelligent Transport Systems: Technologies and Applications by Asier Perallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio García-Zuazola
4. Intelligent Transport Systems Standards by Bob Williams
5. The Future of Intelligent Transport Systems by George Dimitrakopoulos, Lorna Uden, Iraklis Varlamis
6. <https://youtu.be/1TKhZ90lngs>
7. <https://youtu.be/0ygzMc110po>
8. <https://youtu.be/pMcOgiWIGDU>
9. <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:

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

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 the students 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, Madhujit Mukhopadhyay, Ane Books India
2. Introduction to Structural Dynamics , J. M. Biggs, McGraw Hill Book Co.
3. Basics of Structural Dynamics and Aseismic Design, S.R Damodaraswamy 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, frequencies and 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

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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: 3 hrs.

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 in pretensioned 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 and concordancy

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

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 Prestressed Concrete, Guyan Y., 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 analyse prestressed 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, CO₂, Ozone, SO₂, H₂S, Sources and effects on vegetation, materials and Humans, photo-chemical smog, secondary pollutants : NO_x, 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:

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

Text Books:

1. Air Pollution and Control, P. P. Mowli, N. Venkata Subbalya, Divyajyoti Prakashan, 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

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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

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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 fracture 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:




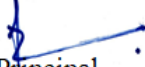
Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU724(D).1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU724(D).2	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU724(D).3	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU724(D).4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU724(D).5	3	3	1	3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

0-Not correlated

1 - Weakly Correlated

2- Moderately Correlated

3- Strongly Correlated

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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:

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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 and harbour Engineering, Charotar Publishing House, Anand, Oza H.P., Oza G.H.
2. Docks, harbour and tunnels engineering, Charoter Publishing House, Anand, Srivastav R.
3. Bridge Engineering, Rangwala, Charoter Publishing House, Anand

Reference Books:

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

Course Outcomes

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

CEU 724(E).1: explain basics of designs of harbours 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	0	0	0	0	0	0	2	1	2	0	0	2	0	1	0
CEU724(E).2	0	0	0	0	0	0	3	2	0	2	1	0	2	1	1
CEU724(E).3	0	0	0	0	0	1	2	0	3	0	0	0	2	1	0
CEU724(E).4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CEU724(E).5	0	0	1	2	0	0	2	1	0	2	0	2	3	3	2

0-Not correlated

1 - Weakly Correlated

2- Moderately Correlated

3- Strongly Correlated

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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: 2 hrs. 30 min.

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, their sizes and materials used;

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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:

CEU733(A).1: explain the site selection for an industrial area and factor related to selection of that site;

CEU733(A).2: explain the various material uses for the construction of an industrial building and the bylaw related to it.;

CEU733(A).3: explain the various services associated with industrial planning;

CEU733(A).4: explain the acts applicable to construction Such as Factory act, pollution control act, explosives act and their utilization of industrial structures;

CEU733(A).5: describe the safety required in industries related to hazards fire and any hazards processes are explained;

CEU733(A).6: describe the different aspects associated with fabrication of industrial shade and 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
CEU733(A).1	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU733(A).2	3	2	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU733(A).3	1	2	1	2	1	0	0	0	0	1	0	1	2	2	0
CEU733(A).4	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU733(A).5	3	3	1	3	1	0	0	0	0	1	0	2	3	3	0
CEU733(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

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CEU733 (B) INTERIOR DESIGNING OF 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: 2 hrs. 30 min.

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

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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:

CEU733(B).1: explain the various components of building, their types, function, sizes and suitability;

CEU733(B).2: explain the various building materials, their types, function, locations and suitability

CEU733(B).3: explain elements of interior designing, principles of design and functional Planning of Interior Spaces;

CEU733(B).4: explain various Interior Construction, elements & materials, their types, suitability and applications

CEU733(B).5: carry out interior planning and designing of typical buildings from the given data;

CO – PO – PSO Mapping:




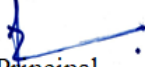
Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU733(B).1	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CEU733(B).2	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU733(B).3	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU733(B).4	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU733(B).5	3	3	3	1	1	1	0	0	0	0	0	1	3	2	1
CEU733(B).6	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

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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: 2 hrs. 30 min.

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,

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

Text Books:

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

Reference Books:

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:

- CEU733(C).1: explain the basic concepts of legal system related to environmental law;
- CEU733(C).2: explain the various laws related to forest, wildlife and biodiversity and air, water, and marine;
- CEU733(C).3: explain different protection laws for environment and large projects;
- CEU733(C).4: explains the laws established for hazardous substances and activities;
- CEU733(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
CEU733(C).1	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU733(C).2	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU733(C).3	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU733(C).4	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2
CEU733(C).5	3	2	0	3	1	0	0	0	1	2	0	1	3	2	2

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

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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: 2 hrs. 30 min.

Course Objectives:

- I. To understand 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, Warning, 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

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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 III Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi
3. Disaster Management Act 2005, Publisher by Govt. of India

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4. Disasters in India Studies of grim reality, Anu Kapur, Neeti Meeta; 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:

CEU733(D).1: explain various categories of hazards and disasters;

CEU733(D).2: explain application of the policy, planning and institutions for disaster mitigation;

CEU733(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
CEU733(D).1	0	0	2	0	3	2	0	3	2	3	0	0	0	0	0
CEU733(D).2	0	0	2	0	3	2	0	3	2	3	0	0	0	0	0
CEU733(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:

- V. To make the students familiar with experimental procedure to verify theorems in structural analysis;
- VI. To impart the students the ability to verify forces and elastic properties in structural members experimentally;
- VII. To make the students competent to draw influence line diagrams of various functions of indeterminate beams (propped cantilever and continuous beam);
- VIII. 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. (**Minimum five** 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

2- 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

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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
Evaluation Scheme: 50 ICA

Credits: 02
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 an analysis/design tool used to solve routine engineering problems. Emphasis is on computer-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

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- (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
Evaluation Scheme : ICA 100

Credits: 02
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 project on approved topic. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. Students should finalize the topic for the project after literature survey in consultation 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 be completed 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 participation of 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. Oral examination shall be conducted by the panel of examiners. For uniform and continuous evaluation, the Evaluation Committee comprising of the Guide, Project Course Coordinator and Expert appointed by the Program Head will award the marks based on the work completed by the end of 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,





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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

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CEU730 SEMINAR

Teaching Scheme: 02 P Total = 02
Evaluation Scheme: ICA 50

Credits: 01
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 seminar shall 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	1	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

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CEU731 INDUSTRIAL VISIT / TRAINING

Teaching Scheme: 00 P Total = 00
Evaluation Scheme: ICA 25

Credits: 01
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 the Departmental Coordinator of T & P Cell for the course. Two weeks trainings shall be arranged during the vacations (after the VI semester), with the consultation of Industry personnel. The students may be permitted to undergo the trainings of minimum 02 weeks as per their choices for which all the official formalities will be completed by the students under the guidance of course coordinator. 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, (for the students unable to complete the Industrial Training during the vacation after VI semester). The students should submit the report based on information collected during visits.

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training/visits and knowledge / skill acquired. The technical report submitted by the students shall be assessed, by the panel of examiners consisting of Project Guide, and expert appointed 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





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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

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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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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 Razzak Rumane
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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

ELECTIVE V

CEU 822 (A) FINITE ELEMENT METHOD

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

Credits: 03
Total Marks: 100

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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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, Seshu P., 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,isoparametric 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

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<i>[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]</i>			

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: 3 hrs.

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.,3rd edition, 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.

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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 & IBH publishing 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
7. <https://www.youtube.com/c/drsuchitahirde/videos>

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

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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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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 Razzak Rumane
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 chemicals used, 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, Control and 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, and natural 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

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Land Pollution:

Sources, Control measures, Effect of Industrial 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 and processing, 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,

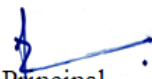
Reference Books:

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.


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Course Outcome:

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

CEU822(D).1: explain and apply the 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, Hrennikoff'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, Banerjee 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:

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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: determine 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

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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)


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Text Books:

1. Earthquake resistant Design of Structures, S. K. Duggal, Oxford University Press Publications, First edition
2. Earthquake resistant design of structures, Pankaj Agrawal and Manish Shrikhande, 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 to Seismic forces - Code of practice, Bureau of Indian Standards, New Delhi
3. Earthquake Design Practice for buildings, Davide Key, Thomas Telford Ltd., London
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, Farzad Neaim
6. www.nicee.org
7. <https://www.youtube.com/c/drsuchitahirde/videos>

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

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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: 3 hrs.

Course Objectives:

- I. To make the students competent for designing steel gantry girders.
- II. To make the students competent for designing steel portal and 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
2. Design of Steel Structures, Ram Chandra, Standard Publishers
3. Design of Steel Structures, Subramaniam

Reference Books:

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

Course Outcome:

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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: 3 hrs.

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 thin cylinder 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 on choice 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 and other canal structures

Principal Components of Hydropower Station: Intakes and Trash racks, Water conductor 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 highway and 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, poisson'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 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

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

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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 of cement concrete pavement construction with construction of joints and quality control test, 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

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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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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. Geotechnical Engineering: S. K. Gulhati& M. Datta, Tata McGraw-Hill, New Delhi
2. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor
3. 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,

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: Suggest 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;




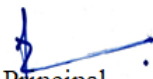
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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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	1	2	1	3	2	1	3	2	3	1	1	1	3	3
CEU823(E).3	3	1	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

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[Curriculum-B. Tech. Civil Engineering w.e.f. 2019-20]

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: 2 hrs. 30 min.

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. Bhawe, 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 Nostand Reinheld 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. Bhawe P. R., Optimal Design of Water Distribution Networks, Nawas Publishing Co, New

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Delhi

3. Jeppson R. W., Analysis of flow in pipe networks, Ann Arbor 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
Evaluation Scheme : ICA 100 + ESE 100

Credits: 06
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 participation of the students in the Project work and knowledge / skill acquired. Internal examination of project shall include demonstration, presentation of complete work and oral examination based on the project work, conducted by the panel of examiners consisting of Project Guide, and Expert appointed by Program Head.

ESE: The End Semester Examination for Project shall consist of Demonstration if any, 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 permitted to undergo the Industry Internship Project for which all the official formalities 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 Industry Internship Project along with the Completion Certificate given by Industry.

ICA: For Option A: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Mid Semester

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Presentation shall be given by the students based on the work completed up to mid-semester. Oral examination shall be conducted by the panel of examiners. For uniform and continuous evaluation, the Evaluation Committee comprising of the Guide, and Expert appointed by the Program Head will award the marks based on the work completed by the end of 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. Oral examination shall be conducted by the panel of examiners. For uniform and continuous evaluation, the Evaluation Committee comprising of the Guide, and Expert appointed by the Program Head will award the marks based on the work completed by the end of 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),




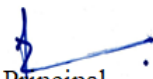
CEU824.2: derive meaningful conclusions from the project work and write a project report,

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

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