Curriculum Structure for B. Tech. Civil Engineering Programme

(In light of NEP 2020)

NCrF Level 6

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Structure for B. Tech. Programme In light of NEP 2020

Member Secretary	BOS Chairman	Dean Academics	Principal

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

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Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

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Credit Distribution for each year and Exit Option

NCrF Level	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	87	08	95
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	131	08	139
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

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Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	15
			ES	16--12	15
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**

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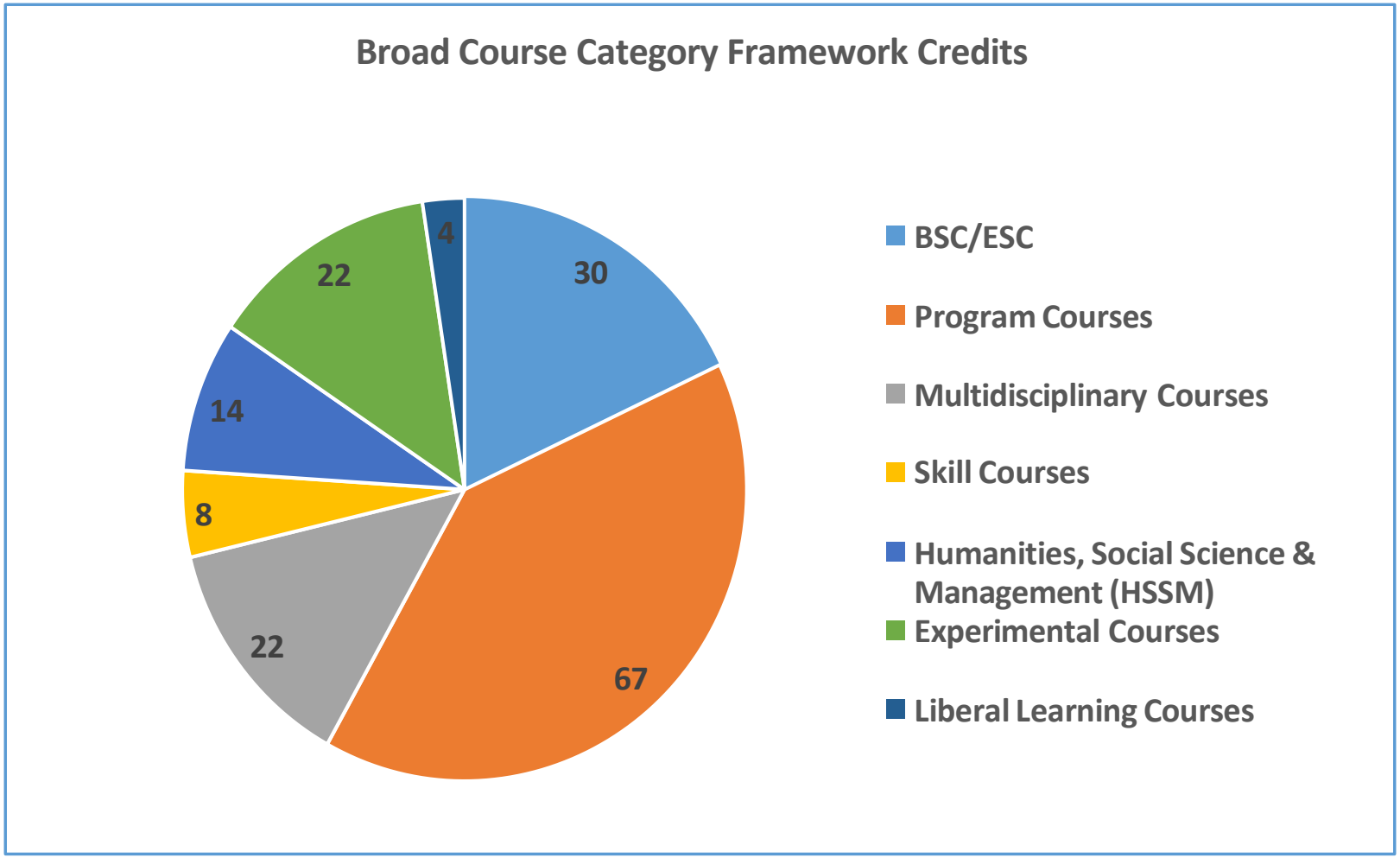

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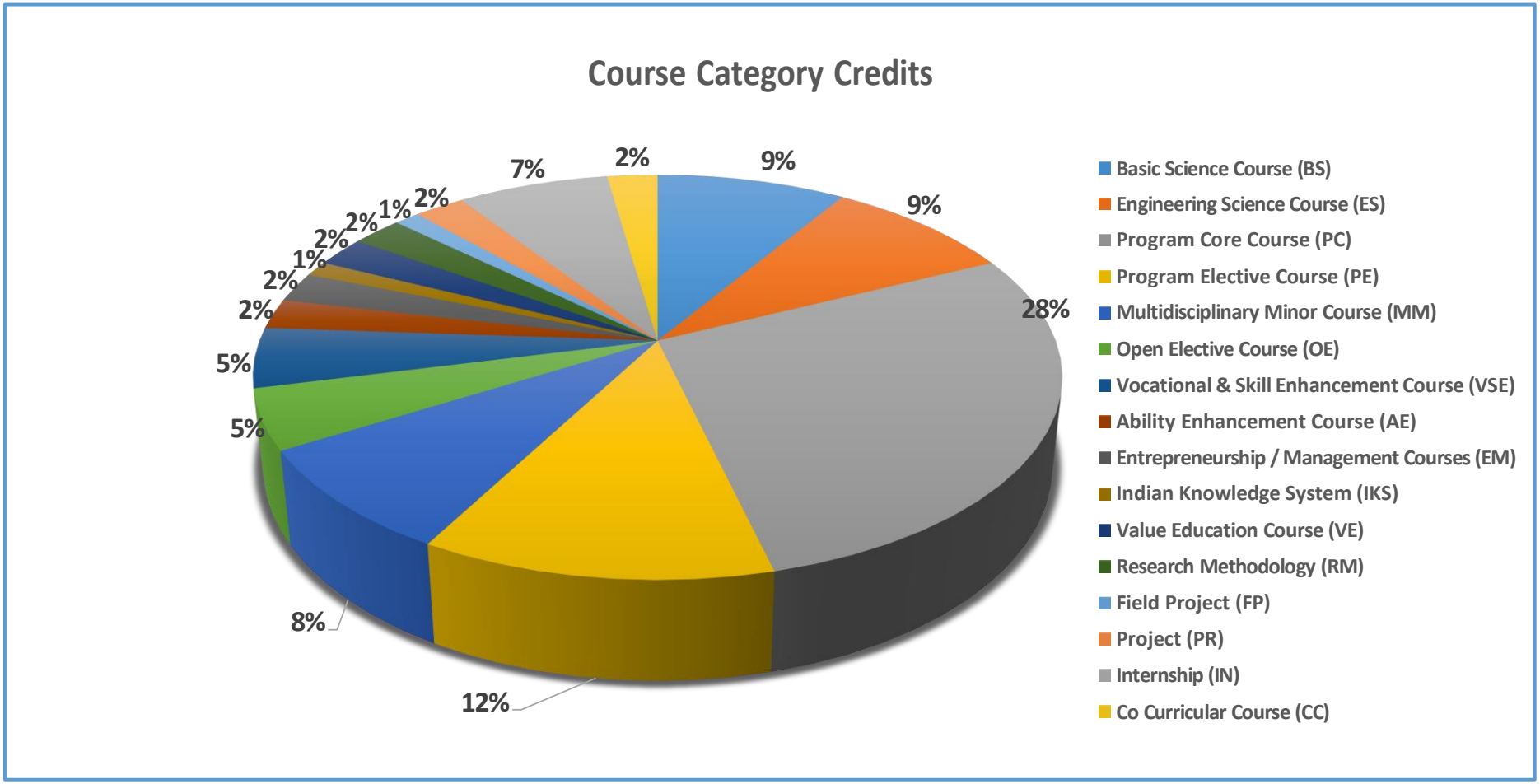

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Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7							15	14-18
2	Engineering Science Course (ES)	8	7							15	12-16
3	Program Core Course (PC)		3	15	11	8	7	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**21**	**20**	**22**	**21**	**21**	**19**	**167**	164-176

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General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTELportal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

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(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:
The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 forUG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:
The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:
Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

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Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One yr. UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two Yr UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three Yr Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

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SEMESTER –III

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM	CE1315 CE1316	Multidisciplinary Minor 1	3			3	15	15	10	60			100	3
PC	CE1301	Strength of Materials	3			3	15	15	10	60			100	3
PC	CE1302	Fluid Mechanics	3			3	15	15	10	60			100	3
PC	CE1303	Water supply Engineering	3			3	15	15	10	60			100	3
PC	CE1304	Transportation Engineering	3			3	15	15	10	60			100	3
PC	CE1305	Strength of Material Lab			2	2					25	25	50	1
VSE	CE1306	Fluid Mechanics Lab			2	2					25	25	50	1
VSE	CE1307	Water supply engineering Lab			2	2					25	25	50	1
VSE	CE1308	Transportation Engineering Lab			2	2					25	25	50	1
PC	CE1309	AutoCAD Drawing			2	2					50		50	1
EM	CE 1310	Idea Lab			2	2					50		50	1
Total			**15**	**-**	**12**	**27**	**75**	**75**	**50**	**300**	**200**	**100**	**800**	**21**

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SEMESTER –IV														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
							Theory				Practical		Total	Credits
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM	CE1415/ CE1416	Multidisciplinary Minor 2	3			3	15	15	10	60			100	3
PC	CE1401	Concrete Technology	3			3	15	15	10	60			100	3
PC	CE1402	Analysis of Structures	3			3	15	15	10	60			100	3
PC	CE1403	Surveying	3			3	15	15	10	60			100	3
OE	SH1401	Open Elective 1	3			3	15	15	10	60			100	3
PC	CE1404	Concrete Technology Lab			2	2					25	25	50	1
PC	CE1405	Building Planning and Computer Aided Civil Engineering Drawing Lab			2	2					50		50	1
PC	CE1406	Surveying Lab			2	2					25	25	50	1
CC	SH1402	Co-curricular Course			4	4			20				20	2
Total			**15**		**10**	**25**	**75**	**75**	**70**	**300**	**100**	**50**	**670**	**20**

Co-Curricular Course: Active Participation in Activities such as: Health and wellness, Sports, yoga education, Tech-fest, College Club Activity, University level/ college level cultural activities, Drama, painting, fine/ applied/ visual performing arts, annual day, department student's association/IE/ISTE/Any professional body, paper presentation, foreign language certificate, NCC, NSS etc.

Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours.

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EXIT CRITERIA FOR U. G. DIPLOMA															
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE			
EX2	CE1411	**Quantity Survey and Estimation**			8	8					50		50		4
EX2	CE1412	**Fundamentals of structural Design**			8	8					50		50		4
OR															
EX2	CE1413	**Internship / Technical Project**			16	16					100@		100		8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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Equivalence Scheme

Programme Name:-B. Tech. Civil Engineering

SECOND YEAR

Sr No.	Course code with Name of course (old) 2019-20		Credit	Course code with Name of course NEP2020 Version II		Credit
	Code	Name		Code	Name	
1	CEU322	Solid Mechanics	03	CE1301	Strength of Materials	03
2	CEU321	Fluid Mechanics	03	CE1302	Fluid Mechanics	03
3	CEU523	Water supply Engineering	03	CE1303	Water supply Engineering	03
4	CEU423	Transportation Engineering	03	CE1304	Transportation Engineering	03
5	CEU327	Solid Mechanics Lab	03	CE1305	Strength of Materials Lab	01
6	-	-	-	CE1306	Fluid Mechanics Lab	01
7	CEU629	Environmental Pollution and Control Lab		CE1307	Water Supply Engineering Lab	01

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8	CEU428	Transportation Engineering Lab	01	CE1308	Transportation Engineering Lab	01
9	-	-	-	CE1309	AutoCAD Drawing	01
10	-	-	-	CE1310	Innovation, Creativity & Entrepreneurship in Civil Engineering	01
11	CEU424	Concrete Technology	03	CE1401	Concrete Technology	03
12	CE521	Theory of Structures	03	CE1402	Analysis of Structures	03
13	CEU422	Surveying	03	CE1403	Surveying	03
14	CEU429	Material and Testing Lab	01	CE1404	Concrete Technology Lab	01
15	CEU529	Building Planning and Drawing Lab		CE1405	Building Planning and Computer Aided Civil Engineering Drawing Lab	02
16	CEU427	Surveying Lab	01	CE1406	Surveying Lab	02
17	CEU322	Building Construction and Materials	03	CE1121	Building Construction	03
18		Engineering Geology		CE1504	PE1 Geology and	

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	CEU324		03		Advanced Survey Group (A) Engineering Geology	03
19	CEU325	Building Construction and Materials Lab	01	CE1122	Building Construction Lab	01
20	CEU326	Engineering Geology Lab	01	CE1505	PE1 Geology and Advanced Survey Group Lab (A)	01
21	CEU421	Hydraulic Engineering	03	CE1603	PE2 Environmental & Fluid Mechanics Group (C) Advanced Fluid Mechanics	03
22	CEU425	Hydrology and Water Resources Engineering	03	CE1702	Hydrology and Water Resources Engineering	03
23	CEU426	Hydraulic Engineering lab	01	-	-	-

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SEMESTER –V														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM	CE1515/ CE1516	Multidisciplinary Minor-3	3			3	15	15	10	60			100	3
PC	CE1501	Design of Steel Structures	3			3	15	15	10	60			100	3
PC	CE1502	Geotechnical Engineering	3			3	15	15	10	60			100	3
PE	CE1503	PE1 **Geology and Advanced Survey group**	3			3	15	15	10	60			100	3
OE	SH1501	Open Elective 2	3			3	15	15	10	60			100	3
VSE	CE1504	Professional Software Lab			4	4					50		50	2
PE	CE1505	PE-1 Lab **Geology & Advance survey group lab**			2	2					50		50	1
PC	CE1506	Design of Steel Structures Lab			2	2					25	25	50	1
PC	CE1507	Geotechnical Engineering Lab			2	2					25	25	50	1
CC	SH1502	Co-curricular Course			4	4			20				20	2
MNC	SH1503	Soft Skills	2			2			20				20	0
Total			**17**		**14**	**31**	**75**	**75**	**90**	**300**	**150**	**50**	**740**	**22**

Co-Curricular Course:: Active Participation in Activities such as: Sports, Tech-fest, College Club Activity, University level /college level cultural activities, annual day, department student's association/IE/ISTE, paper presentation, foreign language certificate, NCC etcCo-**Curricular Course Activities minimum hours** ::2 hours per week or 24 hours

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ADDITIONAL CRITERIA FOR HONOURS

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
PEH1	CE1521	Program Elective for Honors 1 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
PEH2	CE1522	Program Elective for Honors 2 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
	Total													6

ADDITIONAL CRITERIA FOR HONOURS WITH RESEARCH

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER1	CE1531	Research Project Stage 1			08	08					100		100	4

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ADDITIONAL CRITERIA FOR DOUBLE MINOR (BUILDING CONSTRUCTION, PLANNING AND MANAGEMENT)															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			Theoy Hrs /week	Tutoral Hrs /week	Practcal Hrs /week	Total	CT1	CT2	TA	ESE	ICA	ESE			
MN	CE1541	**Introduction to Civil Engineering**	3				15	15	10	60			100		3
MN	CE1542	**Building Construction**	3				15	15	10	60			100		3
	Total		**6**				**30**	**30**	**20**	**120**			**200**		**6**

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SEMESTER –VI														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM	CE1615/ CE1616	Multidisciplinary Minor 4	3			3	15	15	10	60			100	3
PC	CE1601	Design of RC Structure	3			3	15	15	10	60			100	3
PC	CE1602	Estimating & Costing	3			3	15	15	10	60			100	3
PE	CE1603	**PE2- Environment & Fluid Mechanics group**	3			3	15	15	10	60			100	3
PE	CE1604	PE3 **Geotechnical Engineering group**	3			3	15	15	10	60			100	3
VSE	CE1605	Design of RC Structure Lab			2	2					25	25	50	1
PC	CE1606	PC Estimating & Costing Lab			2	2					50		50	1
PE	CE1607	PE 2 **Environment & Fluid Mechanics group Lab**			2	2					25	25	50	1
PE	CE1608	PE 3 **Geotechnical Engineering group Lab**			2	2					25	25	50	1
FP	CE1609	Minor Project			4	4					50		50	2
MNC	CE1610	Disaster preparedness and planning for Civil Engineering	2			2	15	15	20				50	0
MNC	SH1601	NCC/NSS/ Community service etc.							20				20	0
Total			**17**		**12**	**29**	**90**	**90**	**90**	**300**	**175**	**75**	**820**	**21**

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EXIT CRITERIA FOR B. VOC.														
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
EX3	CE1611	**Construction Management and Safety**			8	8					50		50	4
EX3	CE1612	**Railways, airport and tunnel engineering**			8	8					50		50	4
OR														
EX3	CE1613	**Internship / Technical Project**			16	16					100@		100	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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ADDITIONAL CRITERIA FOR HONOURS

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
PEH	CE1621	Program Elective for Honours 1 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
PEH	CE1622	Program Elective for Honours 2 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
	Total													6

ADDITIONAL CRITERIA FOR HONOURS WITH RESEARCH

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER	CE1631	Research Project Stage 2			12	12					100	100	200	6

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ADDITIONAL CRITERIA FOR DOUBLE MINOR (BUILDING CONSTRUCTION, PLANNING AND MANAGEMENT)															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credit s
							Theory				Practical		Total		
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE			
MN	CE1641	**Building Planning and Drawing**	3				15	15	10	60			100		3
MN	CE1642	**Building Estimates and tendering**	3				15	15	10	60			100		3
	Total		**6**				**30**	**30**	**20**	**120**			**200**		**6**

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SEMESTER –VII													
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM	CE1715/ CE1716	Multidisciplinary Minor 5	2			2	15	15	10	60			100	2
PC	CE1701	Hydrology & Water Resources Engg.	3			3	15	15	10	60			100	3
PE	CE1702	PE4 **Structures group**	3	1		4	15	15	10	60			100	4
PE	CE1703	PE5 **Transportation Engg & Construction Management group**	4			4	15	15	10	60			100	4
OE	SH1701	Open Elective 3	2			2	15	15	10	60			100	2
VSE	CE1704	PE4 Lab **Structures group Lab**			2	2					25	25	50	1
VSE	CE1705	PE 5 Lab **Transportation group & Construction management Lab**			2	2					50		50	1
PR	CE1707	Project			8	8					50	50	100	4
MNC	CE1708	Instrumentation and Sensor Technology for Civil Engineering Applications	2			2	15	15	20				50	0
Total			**16**	**1**	**12**	**29**	**90**	**90**	**70**	**300**	**125**	**75**	**750**	**21**

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Note: Project Guide Teaching load: 8 hrs/week

Students can register for the elective in seventh semester under Multidisciplinary Minor 4 using **SWAYAM/NPTEL** etc. portal. Courses will be of completely student's choice but approved by DFB of concerned department (other than MM1 to MM3) and should be **at least of 12 weeks** including tutorials, which will be considered as **4 credit course**.

Students can register and complete online courses for Multidisciplinary Minor 4 any time after completion of semester IV, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of VII th semester.

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ADDITIONAL CRITERIA FOR HONOURS

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
PEH1	CE1721	Program Elective for Honors 1 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
PEH2	CE1722	Program Elective for Honors 2 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
	Total													**6**

ADDITIONAL CRITERIA FOR HONOURS WITH RESEARCH

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER1	CE1731	Research Project Stage 3			16	16					100		100	8

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ADDITIONAL CRITERIA FOR DOUBLE MINOR (BUILDING CONSTRUCTION, PLANNING AND MANAGEMENT)															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE			
MN	CE1741	**Earthquake Resistant Buildings**	3				15	15	10	60			100	3	
MN	CE1742	**Construction Management**	3				15	15	10	60			100	3	
	Total		**6**				**30**	**30**	**20**	**120**			**200**	**6**	

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Equivalence Scheme

Program Name:-B. Tech. Civil Engineering

Third Year

Sr No.	Course code with Name of course (old) 2019-20		Credit	Course code with Name of course NEP2020 Version II		Credit
	Code	Name		Code	Name	
1	CEU521	Theory of Structures	3	CE1402	Analysis of Structures	3
2	CEU522	Geotechnical Engineering	3	CE1502	Geotechnical Engineering	3
3	CEU523	Water Supply Engineering	3	CE1303	Water Supply Engineering	3
4	CEU524	Design of Steel Structures	3	CE1501	Design of Steel Structures	3
5	CEU525	Advanced Surveying	3	PE1 CE1503(B)	Advanced surveying	3
6	CEU526	Building Planning & Drawing	3	-	-	-

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7	CEU527	Geotechnical Engineering Lab	1	CE1507	Geotechnical Engineering Lab	1
8	CEU528	Design of Steel Structures Lab	1	CE1506	Design of Steel Structures Lab	1
9	CEU529	Building Planning & Drawing Lab	2	CE1405	Building Planning and Computer Aided Civil Engineering Drawing Lab	1
10	CEU530	Advanced Surveying Lab	1	PE1 Lab CE1505 (B)	Advanced Surveying Lab	1
11	CEU621	Design of Reinforced Concrete Structures	3	CE1601	Design of Reinforced Concrete Structure	3
12	CEU622	Estimation and Costing	3	CE1602	Estimating and Costing	1
13	PE I CEU623(A)	Structural Mechanics	3	-	-	-
14	PE I CEU623(B)	Reliability Analysis of Structures	3	-	-	-
15	PE I CEU623(C)	Geographic Information Systems and Science	3	-	-	-
16	PE I CEU623(D)	Railway, Tunnel & Airport Engineering	3	PE5 CE1703 (A)	Railway, Tunnel & Airport Engineering	3

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17	PE I CEU623(E)	Hydraulic Modeling	3	-	-	-
18	PE II CEU624(A)	Advanced Design of Steel structures	3	PE4 CE1702 (B)	Advanced Design of Steel Structures	-
19	PE II CEU624(B)	Advanced Concrete Technology	3	-	-	-
20	PE II CEU624(C)	Physico-Chemical Processes for Water Treatment	3	-	-	-
21	PE II CEU624(D)	Open Channel Flow	3	-	-	
22	PE II CEU624(E)	Repairs, Rehabilitation & Retrofitting of structures	3	-	-	-
23	CEU625	Environmental Pollution and Control	03	PE 3 CE1603(B)	Environmental Pollution & Control	
24	CEU633	Open Elective I	3	-	-	
25	CEU627	Design of Reinforced Concrete Structures Lab	1	CE1605	Design of RC Structure Lab	-
26	CEU628	Estimation and Costing Lab	2	-	CE1606 Estimating & Costing Lab	01

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27	CEU629	Environmental pollution and Control Lab	1	PE2 Lab CE1607(B)	Environmental pollution and Control Lab	-
28	PE II CEU630(A)	Advanced Design of Steel structures lab	1	CE1704 (B)	Advanced Design of Steel Structures Lab	1
29	PE II CEU630(B)	Advanced Concrete Technology lab	1	-	-	-
30	PE II CEU630(C)	Physico-Chemical Processes for Water Treatment lab	1	-	-	-
31	PE II CEU630(D)	Open Channel Flow lab	1	-	-	-
32	PE II CEU630(E)	Repairs,Rehabilitation & Retrofitting of structures lab	1	-	-	-
33	CEU631	Minor Project	1	CE1609	Minor Project	-

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SEMESTER –VIII														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE		
RM	SH1801	Research Methodology (Online through SWAYAM/NPTEL)	4			4	15	15	10	60			100	4
EM	CE1801	Construction project Planning and Management	3			3	15	15	10	60			100	3
IN	CE1802	Internship (Online reviews - one in each month)									100	200	300	12
		Total	**07**			**07**	**30**	**30**	**20**	**120**	**100**	**200**	**500**	**19**

Students can register for the elective in eighth semester under Multidisciplinary Minor 4using SWAYAM/NPTEL etc. portal. Courses will be of completely student's choice but approved by DFB of concerned department (other than MM1 to MM3) and should be at least of 12 weeks including tutorials, which will be considered as 3 credit course.

Students can register and complete online courses for Multidisciplinary Minor 4any time after completion of semester IV, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of VIII th semester.

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LIST OF PROGRAM ELECTIVES					
	PE1 CE1503	**PE2 CE1603**	**PE3 CE1604**	**PE4 CE1702**	**PE5 CE1703**
	Geology & Advanced Surveying	**Environment & Fluid Mechanics**	**Geotechnical Engineering**	**Structural Analysis and Design**	**Transportation Engineering and Construction Management**
A	Engineering Geology	Industrial waste water treatment	Foundation Engineering	Advanced Theory of Structure	Railway, tunnels & Airport Engineering
B	Advanced surveying	Environmental Pollution & Control	Ground Improvement Technology	Advanced Design of Steel Structures	Advanced Construction Management
C	GIS and Remote Sensing	Advanced Fluid Mechanics	Geotechnical Investigations and construction practices	Advanced Design of R.C.C. Structures	Advanced Traffic Engineering and Management / Intelligent Transportation System
D	SWAYAM/NPTEL /Other MOOCKs related to vertical (to be approved by DFB)	SWAYAM/NPTEL /Other MOOCKs related to vertical (to be approved by DFB)	SWAYAM/NPTEL /Other MOOCKs related to vertical (to be approved by DFB)	SWAYAM/NPTEL /Other MOOCKs related to vertical (to be approved by DFB)	SWAYAM/NPTEL /Other MOOCKs related to vertical (to be approved by DFB)

SWAYAM/NPTEL etc. portal. Courses for PE1 to PE5 should be related to concerned vertical approved by DFB and should be at least of 12 weeks including tutorials.

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LIST OF PROGRAM ELECTIVES HONOR'S COURSES BASKET (Swayam/NPTEL)						
STREAM	**CE1521**	**CE1522**	**CE1621**	**CE1622**	**CE1721**	**CE1722**
(A)Architecture and Planning	Building Materials as a Cornerstone to Sustainability	Sustainable Architecture	Urban Governance and Development Management	Architectural Approaches to Decarbonization of Buildings	Urban Utilities Planning: Water Supply, Sanitation and Drainage	Urban Landuse and Transportation Planning
(B) Transportation Engineering	Pavement Materials	Pavement Construction Technology	Remote Sensing: Principles and Applications	Sustainable Transportation Systems	Geometric Design of Highways	Introduction to Multimodal Urban Transportation Systems (MUTS)
(C) Structural Engineering	Advanced Concrete Technology	Mechanics of Solids	Admixtures and Special Concretes	Advanced Structural Analysis	Advanced Reinforced Concrete Design	Advanced Pre-stressed Concrete Design

For HONORS degree students are required to select any one stream out of (A), (B) and (C) and earn the credits for all the courses in selected stream through NPTEL/Swayam courses

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LIST OF MULTIDISCIPLINARY MINOR COURSES:

Sr No.	Offering Department	Name of Programme /Minor Course	Students from Department who can register
1	CSE	Data Science	CE,ME,EE,ENTC,INST
		Artificial Intelligence	CE,ME,EE,ENTC,INSTR
2	IT	Machine Learning	CE,ME,EE,ENTC,INST
		Software Engineering	CE,ME,EE,ENTC,INST
3	ENTC	IOT	CE,ME,EE,CSE,IT,INST
		Electronics and Telecommunication Engg.	CE,ME,EE,CSE,IT,INST
4	ME	Mechanical Engineering	CE,EE,ENTC,CSE,IT,INS
		Automation & Robotics	CE,EE,ENTC,CSE,IT,INS
		Industrial Management	ME,CE,ENTC,CSE,IT,EE,INST
5	CE	Building Technology	ME,EE,ENTC,CSE,IT,INST
		Business Economics	ME,EE,ENTC,CSE,IT,INST,CE
6	EE	Energy Engineering	ME,CE,ENTC,CSE,IT,INST
		Electrical Motors & Drives	ME,CE,ENTC,CSE,IT,INST
7	INST	Instrumentation and Control	ME,CE,ENTC,CSE,IT,EE
		Banking and Finance	ME,CE,ENTC,CSE,IT,EE,INST

1. **Eligibility criteria:** Students enrolled in B. Tech program other than Civil Engineering are eligible. The allotment of minor degree Programme will be as per the policy of the Institute.
2. Intake: Minimum 15

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Civil Engineering Department offer Multidisciplinary Minor Basket , Track-I (Building Technology)															
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**								**Credits**
							Theory				**Practical**		**Total**		
			TH	TU	PR	Total	CT1	**CT2**	TA	ESE	ICA	ESE			
MM	CE1315	Multidisciplinary Minor-1 **Basics of Civil Engineering**	3			3	15	15	10	60			100		3
MM	CE1415	Multidisciplinary Minor-2 **Building Construction**	3			3	15	15	10	60			100		3
MM	CE1515	Multidisciplinary Minor-3 **Building Planning & Drawing**	3			3	15	15	10	60			100		3
MM	CE1615	Multidisciplinary Minor-4 **Building Estimates & Tendering**	3			3	15	15	10	60			100		3
MM	CE1715	Multidisciplinary Minor-5 **Construction Management**	2			2	15	15	10	60			100		2
Total			**14**	**0**	**0**	**14**	**75**	**75**	**50**	**300**	**0**	**0**	**500**		**14**

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Civil Engineering Department offer Multidisciplinary Minor Basket , Track-II (Business Economics)														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM	CE1316	Multidisciplinary Minor-1 **Principles of Macroeconomics**	3			3	15	15	10	60			100	3
MM	CE1416	Multidisciplinary Minor-2 **Principles of Microeconomics**	3			3	15	15	10	60			100	3
MM	CE1516	Multidisciplinary Minor-3 **Business Statistics**	3			3	15	15	10	60			100	3
MM	CE1616	Multidisciplinary Minor-4 **Financial Accounting**	3			3	15	15	10	60			100	3
MM	CE1716	Multidisciplinary Minor-5 **Minor Project**	2			2	15	15	10	60			100	2
Total			**14**	**0**	**0**	**14**	**75**	**75**	**50**	**300**	**0**	**0**	**500**	**14**

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Name of Programme /Minor Course	Course Code	Civil Engineering		Mechanical Engineering			Electrical Engineering	
		Building Technology (TRACK-I)	Business Economics (TRACK-II)	Mechanical Engineering (TRACK-I)	Automation & Robotics (TRACK-II)	Industrial Management (TRACK-III)	Energy Engineering(TRACK-I)	Electrical Motors & Drives (TRACK-II)
MinorCourse-1	XX1315/ 16/17	CE1315 Basics of Civil Engineering	CE1316 Principles of Macroeconomics	ME1315 Production Technology	ME1316 Hydraulics and Pneumatics	ME1317 Organizational Behaviour	EE1315 Introduction to Renewable Energy	EE 1316 Electrical Motors
MinorCourse-2	XX1415/ 16/17	CE1415 Building Construction	CE1416 Principles of Microeconomics	ME1415 New and Renewable Energy Sources	ME1416 Automation in Manufacturing	ME1417 Human Resource Management	EE1415 Energy Resources, Environment and Economics	EE 1416 Special Electrical Machines
MinorCourse-3	XX1515/ 16/17	CE1515 Building Planning & Drawing	CE1516 Business Statistics	ME1515 Automobile Engineering	ME1516 Mechatronic Systems	ME1517 Material Management	EE1515 Energy Efficiency in Electrical Utilities	EE 1516 Power Electronics
MinorCourse-4	XX1615/ 16/17	CE1615 Building Estimates & Tendering	CE1616 Financial Accounting	ME1615 Basic of Product Design	ME1616 Industrial Robotics	ME1617 Marketing Management	EE1615 Energy Management	EE 1616 Electrical Drives and Control
MinorCourse-5	XX1715/ 16/17	CE1715 Construction Management	CE1716 Minor Project	ME1715 Industrial Management and Quality Control	ME1716 Computer Integrated Manufacturing	ME1717 Corporate Financial Reporting and Analysis	EE1715 Project	EE 1716 Project

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Name of Programme /Minor Course	Course Code	Electronics Engineering		Computer Engineering		Information Technology		Instrumentation Engineering	
		Internet of Things (TRACK-I)	Electronics and Telecommuni-cation Engg. (TRACK-II)	Data Science (TRACK-I)	AI (TRACK-II)	Machine Learning (TRACK-I)	Software Engineering (TRACK- II)	Instrumentation and Control (TRACK-I)	Banking and Finance(TRACK-II)
MinorCourse-1	XX1315/16	ET1315 Introduction to internet of things	ET1316 Digital Circuits	CS1315 Fundamentals of data science	CS1316 Introduction to Artificial Intelligence	IT1315 Essential math for machine learning	IT1316 Data Structure & Algorithms	IN1315 Industrial Measurement I	IN1316 Bank operations Management
MinorCourse-2	XX1415/16	ET1415 IoT Architecture & Protocols	ET1416 Communication Engineering	CS1415 Computational Data Analytics	CS1416 Data Mining	IT1415 Artificial Intelligence	IT1416 Software Engineering	IN1415 Industrial Measurement II	IN1416 Strategic management and innovation in banking
MinorCourse-3	XX1515/16	ET1515 Programming with Arduino and Raspberry-Pi	ET1516 Microprocessor &Embedded System	CS1515 Natural Language Processing	CS1516 Introduction to Machine Learning	IT1515 Machine Learning Foundation	IT1516 Object Oriented Design & Programming	IN1515 Control system Engineering	IN1516 Security analysis and portfolio management
MinorCourse-4	XX1615/16	ET1615 Industrial Internet of Things	ET1616 Wireless Communication	CS1615 Application of data science	CS1616 Optimization Methods in Machine Learning	IT1615 Fundamentals Deep Learning	IT1616 Software Testing	IN1615 Industrial Automation	IN1616 Spreadsheet based data analysis
MinorCourse-5	XX1715/16/17	ET1715 Project	ET1716 Project	CS1715 Marketing Analytics for Big Data	CS1716 Human Applications of AI	IT1715 Minor Project	IT1716 Minor Project	IN1715 Programming for PLAC,DCS & SCADA	IN1716 IT operations &Management

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LIST OF OPEN ELECTIVE COURSES			
	OPEN ELECTIVE-I	**OPEN ELECTIVE-II**	**OPEN ELECTIVE-III**
COURSE CODE	**SH1401**	**SH1501**	**SH1701**
A	**Appreciating Indian Music**	**Environmental law**	**Operational Research**
B	**Introduction to Human Psychology**	**Cyber law**	**Digital Marketing**
C	**Nanotechnology, Science and Application**	**Introduction to Mass Communication**	**Biology for Engineers**
D	**Geoinformatics**	**Foreign Language Japanese (N5) /German (A1)**	**Foreign Language Japanese(N4) /German(A2)**
E	**SWAYAM/NPTEL** https://onlinecourses.nptel.ac.in/noc22_hs57/preview https://onlinecourses.nptel.ac.in/noc24_hs39/preview https://onlinecourses.nptel.ac.in/noc19_mm21/preview https://onlinecourses.nptel.ac.in/noc24_hs86/preview	**SWAYAM/NPTEL**	**SWAYAM/NPTEL**

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LIST OF PROGRAM ELECTIVES HONOR'S COURSES (Swayam /NPTEL)	
COURSE CODE	Students should select Swayam /NPTEL courses available online other than program core and elective courses offered by the Department with the prior permission of DFB (Departmental Faculty Board).
CE1521	
CE1522	
CE1621	
CE1622	
CE1721	
CE1722	

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LIST OF MINOR COURSES FOR DOUBLE MINOR (Building Construction, Planning and Management)	
COURSE CODE	**Course Name**
CE1541	**Basics of Civil Engineering**
CE1542	**Building Construction**
CE1641	**Building Planning & Drawing**
CE1642	**Building Estimates & Tendering**
CE1741	**Earthquake Resistant Buildings**
CE1742	**Construction Management**

Note: **1) Students may select these courses from Swayam / NPTEL platform with the prior permission of Departmental Faculty Board.**
2) The students registered for Building Technology as Multidisciplinary Minor Track are not eligible to register for Double minor in Building Construction Planning and Management.

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Sample Guidelines for the Honour with Research Project

The purpose of this course is to introduce students to the process of conducting research projects/work. The students will be helped to conceptualise, design and execute a research project by a teacher guide.

Stage-1:

- Student have to complete online course related to topic/perquisite course prescribed by the assigned guide/BOS

  OR
- The focus will be on discussions and analysis of assignments. Learners will be encouraged to read books and research journals related to his/her research topic (literature review, theory and hypotheses etc) and share them in the seminars and evaluated by two member Team of department and same to be enter in ICA format.

Stage-2:

Sample steps:

- Research design/Methodology
- Sampling tool of data collection
- data processing and analysis
- Plan of research report
- Publish review paper in peer view journal/Scopus indexed journal and seminar on it
- The faculty supervisor will assess the method and procedures used by the learner
- At end evaluated by two member Team of department

Stage-3:

- If applicable initiate Actual implementation

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- Data Analysis and Interpretation: The outcome of the research is presented in tabular form with the help of statistical procedures. The data are analysed and interpreted and presented in the form of a research report and presenatation/seminar.
- Report writing
- Publish paper on findings in peer view journal/Scopus indexed journal.
- Two member Team of department will assess the Findings method and procedures
- The faculty supervisor will assess the presentation of major findings depending on the methodology used, presentation of results, interpretation of the results with discussion, summary of the proposed research problem and conclusion.
- Two member Team of department (may evaluated by Guide and external expert) will assess the Findings method and procedures etc

Note : Guide Teaching load : 4 Hrs per student in Research stage -1 /2/3

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SEMESTER III

Course Code	CE1301								Course category			PC1
Course Name	Strength of Materials											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. Fundamental concepts of stresses, strains and response of elastic solid to external loadings.
2. Principles, theorems required for analysis and design of various types of structural members subjected to axial, transverse shear, bending and torsional loadings
3. Systematic methods for solving engineering problems in solid mechanics
4. Theoretical background for further structural analysis and design courses

Course Contents:

Stresses, Strains and Strain energy:

Stresses and strains in bars of varying section, composite bar of two materials and 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, Theories of failure

Shear Force (S.F.) and Bending Moment (B.M.) Diagrams:

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

Flexural and Shear Stresses In Beams:

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Flexural or bending stresses: Theory of simple bending- Assumptions
Derivation of bending equation,

Section modulus of rectangular and circular section (Solid and Hollow), Moment of resistance, Bending stresses in solid, hollow and built up sections. Design of simple beam section

Shearing Stresses: Derivation for shear stress in beam, shear stress distribution across various beam sections like rectangular, circular and built up sections

Torsion:

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.
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 Books:

1. Mechanics of Materials, Beer and Johnston, Tata McGraw Hill Publication
2. Mechanics of Structures- Vol-I, S.B. Junnarkar, Charotar publication house, 12thEdition 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 Halllndia,1998
3. Strength of Materials, G.H. Ryder, Prentice Hall Publications, 3rd Edition, 2002.
4. https://www.youtube.com/channel/UCmE0iFn9Hk8sxMBsOz4EnyQ
5. https://archive.nptel.ac.in/courses/105/105/105105108/

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Course Outcomes:

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

CE1301.1: Explain basic concepts of stress-strain, and evaluate behavior and other physical properties of elastic isotropic materials

CE1301.2: Determine the internal forces in structural elements under different types of loadings (axial, transverse shear, bending, and torsional) and draw their graphical representation

CE1301.3: Determine the internal forces shear force and bending moment in structural elements under different types of loadings and draw their graphical representation

CE1301.4: Determine the torsional stresses in structural elements and circumferential stress & longitudinal stress in thin cylinder and spheres under different types of loadings

CE1301.5: Calculate the deflection at any point on a determinate beam subjected to combination of loads and calculate combined Direct and Bending Stresses in column

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1301.1	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1301.2	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1301.3	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1301.4	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1301.5	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0

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

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Course Code	CE1302							Course category			PC2
Course Name	**Fluid Mechanics**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. basic concept of fluid and its properties
2. principles of hydrostatics and their applications to determine the forces on plain and curved surfaces
3. Various principles of fluid kinetics and fluid dynamics and its applications to solve problems of flow through pipes and channels
4. velocity and discharge measuring instruments for pipes and channels

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: Static pressure at a point, Hydrostatic law, Pascal's law, Pressure head, Atmospheric pressure, Absolute and gauge pressure, Measurement of pressure by manometers and gauges, 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,

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Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluid flow (No problems)

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, Transmission of power through pipe flow

Uniform Flow through channel: Types of channels, Geometrical properties of prismatic channel section, types of flow through channel, Characteristics of uniform flow through prismatic channel, 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

Flow measurements: Velocity measurements: Pitot tube- basic principle of working, types, measurement of velocity by Pitot tube, : Current meter-types and working, Floats-types Discharge measurements : Venturimeter-principle, equation for discharge, orifice plate meter 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

Text Books:

1. Modi and S.M. Seth, Hydraulics & Fluid Mechanics, 14th edition, Standard Book House, New Delhi, 2009
2. A.K. Arora Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers Distributors, New Delhi, 9th edition, 2009

Reference Books and website links:

1. K. Subramanya, Theory and Applications of Fluid Mechanics, , Tata McGraw Hill
2. K. Subramanya, 1000 Solved Problems in Fluid Mechanics, Tata McGraw-Hill Publishing Company Limited, New Delhi,2008
3. K. Subramanya, Open channel Flow, Tata McGraw Hill

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4. R.J. Gadre, Fluid Mechanics through Problems, , New Age International Publishers, New Delhi, 2011
5. Yijay Gupta & Santosh K.Gupta, Fluid Mechanics & its Applications, , 2nd edition, New Age International Publishers, New Delhi, 2011
6. Agrawal S. K, Fluid Mechanics & Machinery,., Tata McGraw Hill Publishing Co. Ltd,1997
7. Vijay Gupta & Santosh K. Gupta, Fluid Mechanics & its Applications, 2nd edition, New Age International Publishers, New Delhi, 2011

Course Outcomes:

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

CE1302.1: Define various physical properties, determine hydrostatic forces on plane and curved surfaces and determine equilibrium of floating bodies

CE1302.2: Differentiate between different types of flows and explain basic concepts of kinematics

CE1302.3: Apply the principles of fluid dynamics to solve problems of flow through pipes

CE1302.4: Define geometrics of channel and apply the principles of fluid dynamics to solve problems of flow through channels

CE1302.5: Apply the principles of fluid statics and dynamics to determine velocity and discharge through pipes and channel by various measuring devices

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1302.1	3	2	0	1	0	0	0	0	0	0	0	0	2	1	0
CE1302.2	3	2	0	1	0	0	0	0	0	0	0	0	2	1	0
CE1302.3	3	2	0	1	0	0	0	0	0	0	0	0	2	1	0
CE1302.4	3	2	0	1	0	0	0	0	0	0	0		2	1	0
CE1302.5	3	2	0	1	0	0	0	0	0	0	0	0	2	1	0

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

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Course Code	CE1303								Course category			PC3
Course Name	**Water Supply Engineering**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. various aspects of water supply scheme in general and recent developments in particular
2. water quality concepts and on water treatment process
3. various units of water treatment plant and the functions

Course Contents:

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

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

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

Water Treatment: Flow diagram of conventional WTP; Aeration: Principle, Purpose, Design of cascade aerator; Flash mixer, function, design, power requirement; Flocculation: Coagulants, quantity of coagulants, Design of mechanical flocculator; Sedimentation: General equation for settling of discrete particles, Plain settling tank, Tube settler, Design of settling tank, Surface over flow rate, Detention period; flow through velocity, weir loading, design of Clariflocculator

Filtration: Objective, Filter Media, Rapid and slow sand filters: Number of filter units, Rate of filtration, Under drainage system, Backwashing, Negative head, Operation and cleaning, Design of slow and rapid sand filters, Design of under drainage system,Pressure filter

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Disinfection: Objectives, Methods of disinfection, Chlorination: Free and combined chlorine, Residual chlorine, Effect of pH, Bleaching powder, Types of chlorination, Pre-chlorination, Post-chlorination, Break point chlorination, Super chlorination

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

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

Text Books:

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

Reference Books and website links:

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:

CE1303.1: Determine the demand of water
CE1303.2: describe various water treatment processes
CE1303.3: describe various water treatment units in water treatment plant
CE1303.4: design various units of conventional water treatment plant
CE1303.5: design distribution system for water supply

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CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1303.1	1	2	3	1	0	1	2	0	0	0	0	1	2	3	1
CE1303.2	1	2	3	1	0	1	2	0	0	0	0	1	2	3	1
CE1303.3	1	2	3	1	0	1	2	0	0	0	0	1	2	3	1
CE1303.4	1	2	3	1	0	1	2	0	0	0	0	1	2	3	1
CE1303.5	1	2	3	1	0	1	2	0	0	0	0	1	2	3	1

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

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Course Code	CE1304								Course category			PC4
Course Name	**Transportation Engineering**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

To make the students aware and understand:

1. Importance of transportation and highways in particular in national development, types of roads
2. Highway planning, engineering surveys, and geometric design of roads
3. Various methods of pavement design
4. Construction procedures and Maintenance, repairs of pavements
5. Components of bridges and their functions, types of bridges and their suitability and bridge hydraulics

Course Contents:

Introduction: Importance of Transportation in National Development, Different modes of transportation and their relative advantages & disadvantages. Characteristics of Road Transport, classifications of roads, History and role of Indian Road Congress (IRC), IRC manuals , Primary information regarding accidents scenario in India and World.

Highway planning & engineering surveys: Necessity, Planning surveys, Preparation of Plans, Highway alignment, Engineering surveys, Drawings and reports, Road development plan 2001-21

Highway geometric design: 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. IRC manuals related to geometric

design, Road marking signs- IRC 67 (2012) and IRC 35 (2015). IRC SP 73(2018)-Manual for specifications and standards for two lane highways with paved shoulders.

Pavement Design: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Flexible pavement using IRC 37:2001,IRC 37:2012, Fatigue and Rutting failure criteria, Burmisters method for design of two layers and three layers pavements, Design of Rigid pavement, joints in rigid pavement

Construction of pavements - specifications and gradation of materials in different layers, construction procedure of WBM Type base course, BBM type base course, construction procedure of Dense Bituminous Macadam, Bituminous Macadam, and Bituminous Concrete type wearing course, construction procedure for Surface Dressing, Penetration Macadam, IRC manuals relevant to construction of bituminous pavements.

Construction of Cement Concrete pavements - construction of pavement slab, alternate Bay method, continuous construction method, Construction of joints.

Specifications /Guidelines laid by Ministry of Road Transport and Highways (MORTH), Orange book for specifications and standard regarding constructions methodology, material used and various treatments.

Highway maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works.

Bituminous surfaces and cement concrete pavements, strengthening of existing pavements using Benkelman Beam study

Highway drainage: importance, Surface drainage, Sub-surface drainage

Road safety audit and measures: Importance of road safety, Relevant IRC special publication manuals such as IRC SP 88 (2010)

Bridge Engineering: Bridge Components and their functions, Abutments, piers and wing wall bearings, approaches, foundation, Types and choice, Site selection, Culverts & causeways- Types and selection

Types of major bridges based on various criteria, Suitability of different types.

Bridge hydraulics -Design flood discharge, Linear waterway, Scour depth, Afflux, Depth of foundation, Free board, Economic span, IRC recommendations, Data collection

Text Books:

1. Khanna S.K. & Justo, Highway Engineering, C.E.G., Nem Chand & Bros., Roorkee, 11th edition.2001

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2. Bindra, S. P, Elements of Bridges, Tunnels and Railways Engineering, Dhanpat Rai & Sons,Delhi,20l0
3. Chakroborty P.and Das A., Principles of Transportation Engineering, lst edition, Prentice Hall of India. 2009

Reference Books and website links:

1. V.N. Vazirani &S.P. Chandola, Transportation Engineering Vol. I & II, 7th edition, Khanna Publishers, New Delhi, 2003.
2. Khisty and Lall, Transportation Engineering: An introduction, 3rd edition, Prentice Hall, 2003.
3. Ponnuswamy, S , Bridge Engineering,., 2nd edition, Tata McGraw Hill Publication, New Delhi, 2007.
4. Papagiannakis A. T. and Masad E. A., Pavement Design and Materials, 1st Edition, John Willey, 2008.
5. Website link: https://irc.nic.in
6. Orange book and various IRC codes and Special Publications regarding standards and specifications

Course Outcomes:

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

CE1304.1: Explain highway planning and investigations

CE1304.2: Carry out geometric design of highways

CE1304.3: Explain construction procedure of bituminous pavements and concrete pavements

CE1304.4: Explain various method of design of flexible pavements and joints in concrete pavements

CE1304.5: Explain bridge components and their functions, types of bridges and their suitability, and bridge hydraulics

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1304.1	3	2	2	1	0	1	1	0	0	0	0	1	2	2	0
CE1304.2	3	2	2	1	0	1	1	0	0	0	0	1	2	2	0
CE1304.3	3	2	2	1	0	1	1	0	0	0	0	1	2	2	0
CE1304.4	3	2	2	1	0	1	1	0	0	0	0	1	2	2	0
CE1304.5	3	2	2	1	0	1	1	0	0	0	0	1	2	2	0

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

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Course Code	CE1305								Course category			PC5
Course Name	**Strength of materials Lab**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. mechanical properties of materials when subjected to different types of loading
2. verification of principals studied in solid mechanics theory by performing experiments in laboratory

Course Contents:

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 CE1301) from the list or otherwise. Minimum ten experiments should be performed.

1. Tension test on mild steel or TOR steel.
2. Hardness tests (Brinell and Rockwell) on mild steel, copper, aluminium, brass and cast iron.
3. Impact test on mild steel, aluminium, copper, brass, cast iron.
4. Shear test on mild steel and aluminium.
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.

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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 Outcomes:

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

CE1305.1: Performs, tension, shear, torsion and compression tests on solid materials

CE1305.2: Determine the toughness of the material using Charpy and lzod test and Brinell and Rockwell hardness number of given metal specimen

CE1305.3: Estimate the elastic constants through compression test on spring and deflection test on beams

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1305.1	2	3	0	1	3	1	0	0	2	1	0	1	2	3	0
CE1305.2	2	3	0	1	3	1	0	0	2	1	0	1	2	3	0
CE1305.3	2	3	0	1	3	1	0	0	2	1	0	1	2	3	0

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

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Course Code	CE1306							Course category			VSE1
Course Name	**Fluid Mechanics Lab**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. measurement of pressure by piezometer, manometers and pressure gauges
2. measurement of discharge by volumetric method, venturimeter, orifice meter, venturiflume, notches and weirs
3. verify Bernoulli's theorem
4. Determine major and minor losses through pipes and determine coefficient of friction of pipes of various materials
5. Determine Manning's constant for prismatic channels

Course Contents:

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 CEU1302) from the List or otherwise.

1. Determination of metacentric height of floating body / ship model
2. Study of types of flow by conducting Reynolds experiment
3. Verification of Bernoulli's Theorem
4. Determination of coefficient discharge of venture meter and orifice meter
5. Determination of coefficient of friction for pipes of different materials
6. Determination of minor losses through various pipe fittings
7. Determination of Manning's constant for rectangular channel
8. Determination of coefficient of discharge of notches and weirs
9. Determination of coefficient of discharge of venturiflum

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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 Outcomes:

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

CE1306.1: Determine roughness coefficients for pipes and channels

CE1306.2: Determine discharge by using various discharge measuring devices for pipes and channel

CE1306.3: Determine hydraulic coefficients of discharge measuring devices

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1306.1	3	0	0	0	0	0	0	0	1	0	0	1	1	2	0
CE1306.2	3	0	0	0	0	0	0	0	1	0	0	1	1	2	0
CE1306.3	3	0	0	0	0	0	0	0	1	0	0	1	1	2	0

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

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Course Code	CE1307								Course category			VSE2
Course Name	**Water Supply Engineering Lab**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. basic concepts of determination of various parameter of water
2. various laboratory experiments and decide appropriate technology to treat water
3. design various treatment units of wastewater treatment plant

Course Contents:

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

PART I: Tests on water

1. Determination of pH of water 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 sulphate content in water
7. Determination of optimum dose of coagulant by Jar test
8. Determination of DO of water sample
9. Determination of solids of water sample

PART II: DESIGNS

Designs of any FIVE treatment units of conventional water Treatment Plant

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PART III: Field visit

Field visit to Water treatment plant: 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)

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.

Course Outcomes:

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

CE1307.1: determine various parameters of water sample

CE1307.2: design various units of water treatment plant

CE1307.3: write a technical report on WTP based on information collected during site visit

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1307.1	2	0	3	1	0	1	2	0	1	0	0	1	2	2	1
CE1307.2	2	0	3	1	0	1	2	0	1	0	0	1	2	2	1
CE1307.3	2	0	3	1	0	1	2	0	1	0	0	1	2	2	1

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

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Course Code	CE1308								Course category			VSE3
Course Name	**Transportation Engineering Lab**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. Experimental procedures as per IS / IRC to determine properties of course aggregates and determine their suitability for road construction
2. Experimental procedures as per IS / IRC to determine properties of bitumen and determine their suitability for road construction

Course Contents:

List of Practicals:

1. To determine the suitability of Aggregate for Road construction by conducting the following test:
   i. Crushing value test,
   ii. Aggregate impact test,
   iii. Los Angeles abrasion test,
   iv. Aggregate shape test - Flakiness index and elongation index determination.
   v. Determination of specific Gravity of coarse Aggregates

2. To determine the suitability of Bitumen for Road construction by conducting the following tests:
   i. Determination of Bitumen Content by Centrifuge Extractor
   ii. Penetration test,
   iii. Ductility test,
   iv. Viscosity test,
   v. Softening point test,
   vi. Flash and fire point test.

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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.

ESE -The End Semester Exam for Practical shall be based on performance in Viva-voce

Course Outcomes:

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

CE1308.1: Conduct the experiments using standard experimental procedure as per IS / IRC on course aggregates

CE1308.2: Conduct the experiments using standard experimental procedure as per IS / IRC on bitumen

CE1308.3: Determine the suitability of aggregates and bitumen for road construction

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1308.1	1	2	2	0	2	0	0	0	1	0	0	2	3	2	1
CE1308.2	1	2	2	0	2	0	0	0	1	0	0	2	3	2	1
CE1308.3	1	2	2	0	2	0	0	0	1	0	0	2	3	2	1

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

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Course Code	CE1309	Course category	PC6
Course Name	**AutoCAD Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	50	-	50	01

Course Objectives:

To make the students aware and understand:

1. Various setting commands in AutoCAD
2. Various drawing commands in AutoCAD
3. Various editing command in AutoCAD
4. Various dimensioning and text command in AutoCAD
5. Various viewing and printing commands in AutoCAD

Course Contents:

1. Practicing various setting commands in AutoCAD
2. Practicing various 2D drawing commands in AutoCAD
3. Practicing various 2D editing/ modifying command in AutoCAD - - selecting objects, various methods of selection, Erase, Move, Copy, Break, Mirror, Rotate, Scale, Trim, Extend, Offset, Blocks- making and inserting blocks
4. Practicing various dimensioning and text command in AutoCAD - Linear, aligned, continue dimensioning
5. Practicing various formatting command in AutoCAD - point style, line weight, line types, colour, text style, dimension style, table style
6. Practicing various viewing and printing commands in AutoCAD, selection of scale
7. Preparing drawings (plans, elevations / sections / perspective) in AutoCAD from given data/ drawings and printing it on A4 size paper by using suitable scales.
8. Practicing various 3D drawing commands in AutoCAD
9. Practicing various 3D editing/ modifying command in AutoCAD

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10. Practicing creating various 3D views and perspective views of 3D objects.

TERM WORK

Term work shall consists of printouts on A4 size paper of 10 drawings of any structural elements / components of building such as

1. Plan and elevation of any one bond in brick masonry
2. Plan and elevations of any one type of stairs
3. Front elevations of any one type door
4. Front elevation of any one type of window
5. Line diagram of a grill for window
6. Front view of a Gate for Compound wall
7. Line plan of 1BHK building
8. Front elevation of building
9. Site plan of building
10. Cross section of a load bearing wall structure
11. Cross section of a framed structure
12. Line diagram of any three types of steel trusses

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.

Course Outcomes:

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

CE1309.1: Create drawings in AutoCAD from the given data / drawing

CE1309.2: Edit, give dimensions and text to the drawings created in AutoCADx

CE1309.3: Print the drawing in AutoCAD to suitable scales

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CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1309.1	1	0	0	0	0	0	0	0	1	0	0	1	1	2	1
CE1309.2	1	0	0	0	0	0	0	0	1	0	0		1	2	1
CE1309.3	1	0	0	0	0	0	0	0	1	0	0	1	1	2	1

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

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Course Code	XX1310							Course category		EM1
Course Name	Idea laboratory									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	50	-	50	01

Course Objectives:

1. Understand design thinking and innovation concepts and approaches.
2. Understand the problems faced by society.
3. Identify new and unaddressed social needs.
4. Design and development of Small project based on Laboratory equipment like Machine hardware, Electronic hardware and software etc.

Course Contents:

Students are expected to complete work in group of maximum three students in pertaining to following aspects under the supervision of course coordinator/teacher.

1. Demonstration of modern manufacturing facilities available at the institute
2. Demonstration of automation and programming tools.
3. Active Sessions on brainstorming, creativity, idea generation, problem-solving techniques and new product development.
4. Visit social sites for the identification of social needs and community problems. The report on this visit is to be submitted.
5. Identification of product problems through customer surveys.
6. The minor project based on hardware (along with software if desire).
7. Building prototype and identifying modifications.
8. Write a project report.
9. The Course Coordinator/Teacher may arrange demonstration with poster presentation of all minor projects developed by the students at the end of semester.

ICA – The Internal Continues Assessment shall be based on project development and knowledge/skill acquired. The performance shall be assessed experiment wise using continues assessment format A and B.

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Course Outcomes:

XX1310.1: Gain knowledge of design thinking and innovation with the modern machines and devices available in the idea lab.
XX1310.2: Generate different ideas for innovative products through ideation and brainstorming.
XX1310.3: Identify, discuss and justify the technical aspects of the chosen idea with a comprehensive and systematic approach.
XX1310.4: Design and develop innovative products for specific problems considering user- centric perspective and market.
XX1310.5: Communicate and report effectively project related activities.

References Books:

1. Ulrich, Karl T., Steven D. Eppinger, and Maria C. Yang. Product design and development Vol. 4. Boston: McGraw-Hill higher education, 2008.
2. Mueller-Roterberg, Christian. "Handbook of design thinking." Independently publish 2018 (2018).
3. Koh, Joyce Hwee Ling, et al. Design thinking and education. Springer Singapore, 2015.
4. Uebernickel, Falk, et al. Design thinking: The handbook. World Scientific, 2020.
5. Woolery, Eli. Design thinking handbook. In Vision, 2019.

Web Resource:

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation?action=enroll
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/design-thinking

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
XX1310.1															
XX1310.2															
XX1310.3															
XX1310.4															
XX1310.5															

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

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SEMESTER IV

Course Code	CE1401								Course category			PC7
Course Name	**Concrete Technology**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. ingredients of concrete, their properties and understand their influence on the quality of concrete
2. fundamental procedure of concrete making and understand the various factors those will affect the quality of fresh as well as hardened concrete
3. methods of concrete mix proportioning
4. 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, 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

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(ii) Time dependent behavior of concrete- creep and shrinkage, Significance of permeability and durability, factors reducing durability- chemical attack, temperature, frost action

(iii) Non-destructive testing of concrete: Rebound Hammer test, Ultra sonic pulse velocity test, concrete core test

Concrete Mix Design: factors to be considered, method of mix design IS (10262) and IRC-44 method, acceptance criteria for concrete as per IS specification.

Cracks in Concrete and Quality Control of Concrete:

(i) Cracks: types of cracks in concrete, causes of cracks, evaluation of cracks, common types of repairs.

(ii) Quality Control: Factors causing variation in the quality of concrete, Quality assurance measures required in concreting, advantages of quality control.

Special Concretes and Concreting in extreme environmental conditions:

Special concretes: Fibre reinforced concrete, polymer concrete, shotcrete, self-compacting concrete, vacuum dewatered concrete.

Text Books:

1. M. L. Gambhir, Concrete Tchnology, 5th Edition, Tata McGraw-Hill Publication.
2. M. S. Shetty, Concrete Technology, , S. Chand Publication

Reference Books:

1. A. R. Santhakumar, Properties of Concrete Technology, Oxford University Press, New Delhi,2007.
2. A.M. evil le, Properties of Concrete, Pearson Education India.

Course Outcomes:

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

CE1401.1: identify and enlist the properties of ingredients and admixtures required to make good concrete

CE1401.2: apply measures to get quality concrete in fresh as well as hardened state and use non-destructive testing procedure for evaluation of concrete properties

CE1401.3: design a Concrete Mix as per IS requirements'

CE1401.4: explain cracks in concrete, its causes and remedies

CE1401.5: illustrate the salient features of special purpose concrete and concreting techniques for extreme environmental conditions'

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CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1401.1	1	1	2	1	0	0	0	0	0	0	0	2	3	1	1
CE1401.2	1	1	2	1	0	0	0	0	0	0	0	2	3	1	1
CE1401.3	1	1	2	1	0	0	0	0	0	0	0	2	3	1	1
CE1401.4	1	1	2	1	0	0	0	0	0	0	0	2	3	1	1
CE1401.5	1	1	2	1	0	0	0	0	0	0	0	2	3	1	1

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

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Course Code	CE1402	Course category	PC
Course Name	**Analysis of Structures**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives

1. To establish an understanding to identify type of structure and methods suitable to analysis it.
2. Studentshouldanalyzedeterminatebeamsandframesandindeterminatebeams
3. To apply Energy theorems for analysis of Beams and Trusses
4. To analyze the structure using various force methods and displacement methods
5. To analyze the beam using stiffness matrix methods

Course Contents:

Introduction: Classification of Structures, Concept of indeterminacy, Degree of static indeterminacy and degree of kinematic indeterminacy for beam, portal frame, arch and truss, Introduction to methods of analysis, force method and displacement methods

Analysis of Fixed Beam and Propped Cantilever: Consistent Deformation Method, Analysis of fixed beam and propped cantilever, rotation and sinking of support

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 Application of Muller's Breslau's Principle to draw Influence Line Diagrams of beam and trusses

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

Slope Deflection Method: Derivation, Analysis of continuous beams without and with sinking of support, Analysis of portal frames (with vertical legs only) without and with side sway

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Moment Distribution method: Absolute and Relative Stiffness, Distribution and carry over theorem, Analysis of continuous beams without and with sinking of support, Analysis of portal frames (with vertical legs only) without side sway

Introduction to Matrix Method: Concept and properties of stiffness matrix and flexibility matrix, Introduction of stiffness matrix method, Analysis of continuous beams using structures/system approach of stiffness matrix method without and with sinking of support

Text Book:

1. Structural Analysis, Devdas Menon, Narosa Publishing House, New Delhi
2. Theory of Structures, Dr. B. C. Punmia, Er. A. K. Jain and Dr. A. K. Jain, Laxmi Publication (P) Ltd., New Delhi

Reference Book:

1. Intermediate Structural Analysis, Wang C. K., International Edition, McGraw Hill Inc.
2. Basic Structural Analysis, Reddy C. S, Tata Mc-Graw Hill, New Delhi
3. Elementary Structural Analysis,Utku, Norris and Wilbur, McGraw Hill Inc
4. Structural Analysis, R. C. Hibbler, Prentice Hall
5. https://www.youtube.com/channel/UCmE0iFn9Hk8sxMBsOz4EnyQ
6. https://archive.nptel.ac.in/courses/105/105/105105166

Course Outcomes

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

CE1402.1: Identify the type of structure and methods suitable to analysis it.

CE1402.2: Analyze the fixed beam, propped cantilever and three hinge arches.

CE1402.3: Draw Influence Line Diagrams of various function in determinate beams and trusses

CE14024: Analyze the continuous beam and portal frames using moment distribution method and slope deflection method.

CE1402.5: Analyze the continuous beam using stiffness matrix method

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CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1402.1	3	3	0	1	0	0	0	0	0	0	0	2	3	1	0
CE1402.2	3	3	0	1	0	0	0	0	0	0	0	2	3	1	0
CE1402.3	3	3	0	1	0	0	0	0	0	0	0	2	3	1	0
CE1402.4	3	3	0	1	0	0	0	0	0	0	0	2	3	1	0
CE1402.5	3	3	0	1	0	0	0	0	0	0	0	2	3	1	0

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

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Course Code	CE1403								Course category			PC8
Course Name	**Surveying**											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. Various surveying equipment and their uses
2. traversing with prismatic compass , plane table, theodolite and total station
3. determination of are with plannimeter
4. levelling process and its applications, contouring
5. Curves and its setting out on field

Course Contents:

Introduction: Surveying- Necessity & purpose, Classification of survey, principles of surveying, Basic measurements in surveying -

Traversing: Open & closed traverse, Survey stations, Survey lines- ranging, selection of suitable stations, Bearings of survey lines, local attraction and correction to bearings, included angles from bearing, Offsets-Types, measurement by fibre tape and laser, Booking field notes, Plotting of traverse, errors, graphical method of adjustment,

Levelling: Bench mark & its types, Auto level, Digital level, Temporary adjustments, levelling staffs and its types, booking of field readings in field book, calculation of RL, Arithmetic checks, Profile levelling, cross sectioning, difficulties, errors and mistakes in levelling, correction for curvature & refraction.

Contouring: Definition, characteristics, contour interval, methods of locating contours, interpolation of contours, contour maps & it's uses, contour drawing.

Theodolite Traversing: Component parts of Digital Theodolite, fundamental lines, temporary adjustment, measurement of horizontal, vertical and deflection angles, magnetic bearing, prolonging a straight line, laying off horizontal angle, Theodolite

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traversing, Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gale's traverse table.

Total station: Component parts of total station, accessories, types of reflectors, Initial settings, temporary adjustments, Measurement of distances and angles using Total station, advantages, Field Procedure for total station survey, Errors in Total Station Survey

Curves: Elements of simple and compound curves – Method of setting out

Text Books:

1. T.P. Kanetkar and S. V. Kulkarni, Surveying part-I & II, Pune Vidyarthi Griha Prakashan, Pune, 24th Edition,2002
2. B. C. Punmia, Surveying Vol I & II, Laxmi Publication New Delhi,11th edition, 2008
3. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

Reference Books and website links:

1. K. Duggal ,Surveying Vol. I and II, Tata McGraw Hill Publishing Company Ltd., New Delhi
2. Santosh kumar Garg, Surveying Vol. I and II, Khanna Publishers, New Delhi
3. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
4. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
5. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

Course Outcomes:

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

CE1403.1: Explain traversing with prismatic compass

CE1403.2: Explain the levelling process, enter the readings in the field book, determine RLs, and apply checks, contours, its characteristic, uses of contour maps, and methods of plotting contours

CE1403.3: Explain traversing with theodolite making computation for traverse

CE1403.4: Explain Total Station and its applications in surveying

CE1403.5: Explain curves, its elements, types and setting by various methods

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CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1403.1	2	1	0	1	3	0	0	0	3	1	0	1	1	1	2
CE1403.2	2	1	0	1	3	0	0	0	3	1	0	1	1	1	2
CE1403.3	2	1	0	1	3	0	0	0	3	1	0	1	1	1	2
CE1403.4	2	1	0	1	3	0	0	0	3	1	0	1	1	1	2
CE1403.5	2	1	0	1	3	0	0	0	3	1	0	1	1	1	2

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

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Course Code	SH1401B								Course Category			OE1
Course Name	Introduction to Human Psychology											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

To make the students will be able to:

1. Understand the human behaviour.
2. Helps humans in exerting more control over situations
3. Basic cognitive processes that guide human behaviours.
4. Tackling everyday problems and attaining optimal solutions
5. Knowledge about human cognitive systems in designing sophisticated Artificial Intelligence (AI) systems.

Course Contain:

Introduction to Cognitive Psychology:

- History,
- Theory
- Research in Human Cognition

Basic Cognitive Processes:

- Object Perception and Recognition
- Attentional Processes and cognition
- Memory Introduction
- Long Term Memory

Organizational Knowledge:

- Memory of general knowledge.
- Concept Formation
- Visual and Spatial Memory

The Use of Knowledge:

- Human language skills.
- Thought process and Problem Solving
- Reasoning
- Decision Making

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Textbooks:

1. Kathleen Galotti, Cognitive Psychology, Cengage Learning.
2. Robert Stenberg, Applied Cognitive Psychology, Cengage Learning.

References:

1. Bridger Riegler, Cognitive Psychology, Pearson Press
2. Stephen Kosslyn, Cognitive Psychology, PHI Press

Course Outcomes:

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

SH1401B.1: demonstrate history of Human Psychology.
SH1401B.2: understand, theory and research in Human Psychology.
SH1401B.3: learn the Basic Cognitive Processes.
SH1401B.4: understand about Organizational Knowledge.
SH1401B.5: apply the knowledge of human Psychology to developed process of problem solving, reasoning, decision making.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401B.1	2	3	0	0	0	0	0	1	2	0	0	0
SH1401B.2	2	0	0	0	0	0	0	1	2	0	0	0
SH1401B.3	2	2	0	0	0	0	0	1	2	0	0	0
SH1401B.4	2	0	0	0	0	0	0	1	2	0	0	0
SH1401B.5	2	2	0	0	0	0	0	1	2	0	0	0

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

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Course Code	SH1401C								Course Category			OE1
Course Name	Nanotechnology, Science and Application											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	20	00

Course Objectives:

Students will be able to:

1. understand the history, background and nature of Nano science and nanotechnology as well as the quantum and Nano sized scale effect on materials.
2. acquire theoretical understanding of different types of nanostructure
3. understand the synthesis technique and its types.
4. learn the different methods of characterization.
5. aim to approach towards advance research and application of nanoparticals.

Course Contents:

Basics of Nanoscience:

Introduction, Effect of reduction of dimensions on physical properties, History of Nanotechnology, Quantum size effect,

Different classes of Nanomaterial's:

Classification based on dimensionality-Quantum Dots, Wells and Wires, preparation of quantum nanostructures, conduction electrons and dimensionality, Fermi gas and density of states, potential wells, partial confinement, properties dependent on density of states, exitons, single electron tunnelling.

Material Synthesis Method:

Nanostructures of one dimension: Crystalline growth, Template based synthesis. Nanostructures of two dimensions: Fundamentals of thin film growth, physical vapour deposition, chemical vapour deposition, atomic layer deposition, self-assembly, Sol-Gel films, and electrochemical deposition.

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Material Characterization Methods:

UV visible microscopy, Scanning electron microscopy (SEM), Transmission electron microscope (TEM), x-ray diffraction (XRD). Atomic Force Microscope (AFM)

Application of Nanomaterial's:

Agriculture field, Medical field, Space Technology, Food Technology, Water Treatment, Energy Sector, Automobile, Electronics Field, Textile Field, Cosmetic.

Textbooks:

1. Introduction to Nanotechnology by C.P. Poole Jr. and F.J. Oweus, Wiley Interscience
2. Nano-Technology by Gregory Timp (Editior), AIP Press, Springer.
3. Pradeep T., "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education Pvt. Ltd.

Reference Books and website links:

1. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press
2. Graphene: Synthesis and applications, edited by Wonbong Choi and Jo-won Lee.
3. Semiconductor Nanostructures and Nanodevices Vol 1-5-A. A. Balandin, K. L.Wang.
4. Springer Handbook of Nanotechnology: Bharat Bhushan
5. Nanofabrication towards biomedical application: Techniques, tools, Application and impact: Ed. Challa S., S. R. Kumar, J. H. Carola
6. A. S. Edelstein and R. C. Cammarata, "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Pub., 1998.
7. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Imperial College Press, 2004.
8. G.A. Ozin and A.C. Arsenault, "Nano chemistry : A chemical approach to nanomaterials", Royal Society of Chemistry, 2005.
9. Joel I. Gersten, "The Physics and Chemistry of Materials", Wiley, 2001.
10. K.W. Kolasinski, "Surface Science: Foundations of Catalysis and Nanoscience", Wiley, 2002.
11. Physical Chemistry – Atkins Peter, Paula Julio.

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12. Nanotechnology in Biology and Medicine: Methods, Devices, and Applications.

Course Outcomes:

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

SH1401C.1: learn basic of Nano science with special, emphasize on nanomaterial's.
SH1401C.2: correlate physical behavior of materials at the Nano scale.
SH1401C.3: understand the physical, chemical and other important methods for synthesis of nanoparticles.
SH1401C.4: understand the various characterization techniques of Nano materials.
SH1401C.5: apply the knowledge gained to suggest different applications of Nano science and technology.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401C.1	2	0	2	0	0	0	0	0	1	2	2	3
SH1401C.2	3	2	3	0	2	0	2	0	0	3	2	3
SH1401C.3	3	2	3	2	0	0	3	3	1	3	3	3
SH1401C.4	3	2	3	2	2	0	2	0	0	3	3	3
SH1401C.5	3	2	3	2	2	0	3	1	0	3	3	3

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

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Course Code	SH1401D	Course Category	OE1
Course Name	Geoinformatics		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	20	00

Course Objectives

To make the students aware and understand:

1. The fundamental concepts of Geoinformatics, including Geographical Information Systems (GIS), Remote Sensing (RS), and Global Positioning Systems (GPS).
2. The functionalities and applications of various Remote Sensing and GIS software.
3. The importance of data acquisition, database development, and analysis in a GIS environment.
4. The significance of spatial data structures, GIS analysis, and pre-processing techniques.
5. The real-world applications of Geoinformatics in engineering fields through case studies.

Course Contents;

Fundamentals of Remote Sensing: Principles of Remote Sensing and Electromagnetic Radiation (EMR). Interaction mechanisms of EMR with the Earth's surface and image formation. Types and characteristics of sensors and platforms used in Remote Sensing.

Remote Sensing Data Analysis: Types of satellite data products in visible and other bands. Multiband concept and spectral signatures for different Earth features. Visual image interpretation and digital image processing methods. Basics of Photogrammetry and its Applications in Remote Sensing.

Global Positioning System: Fundamentals of GPS technology. Working principles of satellite-based navigation systems. Applications of GPS in mapping, navigation, and surveying.

Geographic Information System (GIS): Components of GIS: Hardware, software, data, and users. Methods of spatial data acquisition and attribute data management. Pre-processing, storage, and database management in GIS. Raster and vector data structures and their significance. GIS analysis functions and spatial queries.

Applications of Geoinformatics in various fields of Engineering including hands on exercises.

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Text Books:

1. James B. Cambell, 'Introduction to Remote Sensing', Taylor & Francis.
2. John R Jensen, 'Introductory Digital Image Processing: A Remote Sensing Perspective', Prentice Hall, New Jersey
3. M. Anji Reddy, 'Text book of Remote Sensing and GIS', BS Publications

Reference Books:

1. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman Remote Sensing and Image Interpretation, 7th Edition, Wiley Publication
2. George Dr. Joseph Fundamentals of Remote Sensing, University Press.

Course Outcomes :

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

SH1401D.1: Explain the fundamental principles of Remote Sensing, GIS, and GPS

SH1401D.2: Apply knowledge of data acquisition, pre-processing, and GIS database management.

SH1401D.3: Utilize different Remote Sensing and GIS software for spatial analysis and visualization.

SH1401D.4: Analyses and interprets multispectral remote sensing data for practical applications.

SH1401D.5: Implement GIS-based solutions for various engineering applications including environmental monitoring, urban planning, and disaster management.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401D.1	3	2	1	0	1	2	2	1	0	1	0	2
SH1401D.2	3	3	2	2	2	2	2	1	0	1	0	2
SH1401D.3	3	3	3	3	3	2	2	0	0	1	0	2
SH1401D.4	3	3	3	3	3	2	3	0	2	3	2	2
SH1401D.5	3	3	3	3	3	2	3	0	2	3	2	2

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

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Course Code	CE1404	Course category	PC10
Course Name	**Concrete Technology Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. Testing for physical properties of ingredients of concrete like cement, fine and coarse aggregates
2. different tests conducted on fresh and hardened concrete
3. proportioning a concrete mix for given specification of ingredients

Course Contents:

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 CE1424) from the list or otherwise. Minimum eight practicals should be performed. From the group of experiments given below, tests of groups I, 3,6and8 are compulsory while other tests are chosen from remaining groups as required

Group of Experiments:

I. 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

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8. Concrete mix design as per IS specifications.

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.

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:

CE1404.1: determine the different physical properties of cement, fine and coarse aggregates at field and in lab to decide their suitability for making concrete

CE1404.2: Determine the properties of fresh and hardened concrete to assess quality of concrete

CE1404.3: Design concrete mix as per IS specifications

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1404.1	1	2	2	0	2	0	0	0	1	0	0	2	3	2	1
CE1404.2	1	2	2	0	2	0	0	0	1	0	0	2	3	2	1
CE1404.3	1	2	2	0	2	0	0	0	1	0	0	2	3	2	1

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

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Course Code	CE1405	Course category	PC11
Course Name	**Building Planning & Computer Aided Civil Engineering Drawing Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	50	-	50	02

Course Objectives:

To make the students aware and understand:

1. Planning of residential and public buildings as per owners requirement, principles of planning and building bye laws
2. Developing various constructional drawings of building using computer aided drawing software AutoCAD
3. Developing 3D vies / perspective of building using computer aided drawing software AutoCAD

Course Contents:

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

List of Practicals:

1. Developing working drawing (front elevation, detailed plan, detailed sectional view, site plan, foundation plan, terrace plan,) of single storied residential building from the given line plan using AutoCAD and printing on full / Half imperial size paper.
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 (front elevation, detailed plan of each detailed sectional view, site plan, foundation plan, terrace plan,) of the planned building (in sr. no. 2) from the given line plan using AutoCAD and printing on full / half imperial size paper
4. Developing 3D view / drawing of 1 BHK building and printing to a suitable scale.
5. Preparation of line plans of any two public buildings like: Building for Education – School,

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College, Library, Hostel

Building for health –Dispensary, Hospital
Building for public services –Bank, Post office, Market, Sports Club, office

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.

Course Outcomes:

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

CE1405.1 Develop working drawing of single storied residential building from the given line plan using AutoCAD and print

CE1405.2 Plan two storeyed framed structure type residential building and public buildings from the given data

CE1405.3 Develop 3D model of 1 BHK building

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1405.1	1	0	0	0	3	0	0	0	1	0	0	1	0	1	3
CE1405.2	1	0	0	0	3	0	0	0	1	0	0	1	0	1	3
CE1405.3	1	0	0	0	3	0	0	0	1	0	0	1	0	1	3

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

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Course Code	CE1406	Course category	PC12
Course Name	**Surveying Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. Levelling process using auto level and digital level
2. Traversing process using prismatic compass and theodolite
3. Measurement of area using plannimeter
4. Use of total station for measuring angles and distances

Course Contents:

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

List of Practicals:

1. Plane table surveying for survey of a given area and plotting of features of ground on A1 size sheet
2. Chain and compass surrey for survey of a given area (Closed Traveser) , recording the observations in the field book, and plotting of features of ground on A1 size sheet
3. Profile levelling using auto level / Digital level for minimum 500 m length, entering reading in field book, making calculations, applying checks, and Plotting of L-section & cross sections of road on A1 size sheet.
4. Block contouring using auto level / Digital level for minimum 200 x 200 m area and Plotting of contour map on A1 size sheet
5. Theodolite / Total station traversing, (Open traverse), recording the observations in the field book, and plotting of features of ground on A1 size sheet
6. Measurement of area by digital plannimeter

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7. Plotting the simple curve on ground by any one method

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 Outcomes:

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

CE1406.1: Carry out various types of levelling, enter the reading in levelling books, make calculations, plot the L- section, cross sections and contours

CE1406.2: Carry out traversing by Theodolite and Total station, enter the readings in field book, make calculation and plot the plan

CE1406.3: Carry out plane table surveying

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1406.1	2	1	1	0	3	0	0	0	3	2	1	1	2	2	3
CE1406.2	2	1	1	0	3	0	0	0	3	2	1	1	2	2	3
CE1406.3	2	1	1	0	3	0	0	0	3	2	1	1	2	2	3

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

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Course Code	CE1411							Course category			EX1
Course Name	**Fundamentals of structural Design**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	-	-	-	-	-	-	-	50	-	-	04

Course Objectives:

To make the students aware and understand:

1. knowledge of measurement of quantities of various components of Civil Engineering structures
2. knowledge of specification and rate analysis of various items of civil engineering structures
3. preparing estimates of various Civil Engineering structures as per Specifications and by using current schedule of Rates
4. knowledge of valuation of building
5. skill to use software e.g. QuePro for preparing estimates
6. 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,

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Detailed estimation for Flat roof building, Detailed estimate of Earth work in roads including hill road, Detailed estimate of steel reinforcement in RCC works for Slabs, Beams and Columns, Footings, Stair Case etc., bar bending schedule, Detailed estimation for septic tank, soak pit, sanitary and water supply installations.

Specifications: Purpose, Necessity and principles of specification writing, Types of specifications, Drafting and writing of detailed specifications of important items of construction

Rate analysis: Importance and need of rate analysis, Factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost. Performance of rate analysis, Analysis of material and labour requirements, Quantity of materials per unit rate of work, labour estimate, various important terminologies like work charged establishment, contingencies, percentage charges, overheads etc.

Cost Accounting: Various methods, classification of cost, direct and indirect charges, distribution of overheads, MAS account, issue rate of store accounts.

Valuation: Purpose of valuation, value and cost, market value, potential value, Sentimental value, scrap value etc. Net and gross return, Free hold and lease hold property, Sinking fund, Depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building, time cost relationship, qualifications and functions of a valuer

Introduction to Contracts tendering: Types of contracts, Tender, Tender documents, tendering procedure, Qualitative and quantitative evaluation of tenders

Text books:

1 Estimating and Costing in Civil Engineering -Theory and Practice, Datta B.N., 23rd Edition, UBS Publisher, New Delhi, 2003
2 Estimating and Costing, Patil B. S., Oriental Longmans Publication, New Delhi
3 Estimating and Costing, R. C. Rangwala, Charotar Publ. House, Anand
4 Estimating, Costing Specifications & valuation in Civil Engineering, M. Chakraborty,

Reference Book:

1. Civil Estimating & Costing: Including Quality Surveying, Tendering and Valuation, Upadhyay A.K., S K Kataria and Sons
2. Theory and Practice of Valuation, Roshan Namavati, Lakhani Publications
3. Valuation Principles and Procedures, Ashok Nain, Dewpoint Publications
4. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New Delhi
5. Construction Cost Estimating: Process and Practices, Leonard Holm, John E.

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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 :

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

CE1411.1: Explain various types of estimates and prepare approximate estimates

CE1411.2: prepare quantity estimates for buildings and other Civil Engineering structures as per Specifications;

CE1411.3: draft detailed specifications and work out rate analysis for all works related to Civil engineering projects;

CE1411.4: carry out rate analysis

CE1411.5: 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
CE1411.1	3	0	2	1	0	3	0	0	3	3	3	3	3	3	3
CE1411.2	0	0	3	0	0	2	0	0	3	3	3	3	2	2	3
CE1411.3	3	0	2	1	0	0	0	0	3	3	3	3	3	3	3
CE1411.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3	3
CE1411.5	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

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Course Code	CE1412	Course category	EX2
Course Name	**Fundamentals of structural Design**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	-	-	-	-	-	-	-	50	-	-	04

Course Objectives:

To make the students aware and understand:

1. To inculcate in the students, the understanding of structural steel, reinforced concrete and general structural behaviour of steel & RCC structural elements , design philosophies
2. To make the students familiar with relevant BIS codes, design aids for their effective use in the steel structure design & reinforced concrete design
3. To impart the students, the ability to analyse, design & detail of RCC as well as structural steel elements according to relevant BIS codes & design aids

Course Contents:

Fundamentals of steel structure:

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 combinations: Loads-dead loads, imposed loads, temperature effect, earthquakes, determination of wind loads as per IS 875(part 3), load combinations, Calculation of design loads for truss members

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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, design of compression member

Reinforced Concrete Structures:

RCC: functions of reinforcement, material properties, types of limit states, partial safety factors for material strength, characteristic strengths, characteristic load, design load as per IS 456:2000. Types of loads and combinations as per IS: 875:2002.

Limit State of collapse (flexure): assumptions, steel, strain diagram and stress-strain relationship for concrete and block diagram for singly reinforced section, design parameters and constants, ultimate moment of resistance. Under- reinforced, over-reinforced and balanced sections. IS specifications regarding spacing, cover, minimum reinforcement, effective span in beams.

Analysis and design: determination of design constants, ultimate moment of resistance, ultimate load carrying capacity, design of rectangular sections.

Design of Shear reinforcement and Bond:

Shear; Meaning of shear in beams and slabs, IS code specifications, Various forms of shear reinforcement, Use of bent up bars, Zones of Minimum shear reinforcement. Numerical problems on design of shear reinforcement in beam.

Bond: Meaning of bond as per IS code provisions. Meaning and calculation of development length in tension and compression

Design of Slabs:

Slabs, support conditions, I.S. specifications regarding main steel, distribution steel, spacing and cover for reinforcement, effective span, minimum reinforcement. Limit state of serviceability for slabs for deflection criteria only. Design of one way and cantilever slab

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including development length check only

Design of two-way slab with four edges discontinuous and provisions of torsion reinforcement at corners (As per IS 456:2000, table no 26 cases no 9 only). Check for deflection only.

Design of axially loaded short Columns and footing:

Limit state of collapse in compression, assumptions, effective length, slenderness ratio, short and long columns, and minimum eccentricity. IS specifications for reinforcement in column.

Load analysis for a column: load on an axially loaded column from beams at a different floor level in a building. Design of axially loaded short square and rectangular column.

Various types of RC footings: Isolated and Sloped footings, combined footings, piles. IS specifications for reinforcement in footing, Design of axially loaded isolated footing of uniform thickness: Flexural design with Checks for one-way shear, Two- way shear and bond.

ICA Evaluation: ICA marks shall be based on minimum 10 assignments on design of RCC and Steel Structural elements along with viva-voce.

Reference Books and Websites

Design of Steel structures

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. Limit State Design in Structural Steel, Shiyekar M. R, PHI learning 3rd edition
6. Design of Steel Structures, Suchita Hirde - Manoj Hedaoo, Narosa Publishing House Pvt. Ltd. 2023
7. Limit State Design of Steel Structures as per IS:800/2007, S. Kanthimathinathan, I K International Publishing House Pvt. Ltd., 2014
8. Comprehensive Design of Steel Structures", B C Punamia, Laxmi Publications 2015

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9. Design of Steel Structures Vol. I & II, Ramchandra, Std Book house 2015
10. https://nptel.ac.in/courses/105/106/105106112/

Design of RCC structures

1. Limit State Theory and Design of Reinforced Concrete, V. L. Shah- S. R. Khare, Structures Publications, Pune
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.

Course Outcomes

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

CE1411.1: Assimilate about the RCC & Structural steel as a material, structural behaviour of RCC & steel structural elements & design philosophies for design of RCC &

Steel structures;

CE1411.2: Calculate design loads for truss members

CE1411.3: Analyze and design welded/ bolted connections, tension members, compression members with detailing as per relevant IS codes

CE141114: Analyze and design one way slab , two way slab with detailing of reinforcement as per relevant IS codes;;

CE1411.5: Design rectangular beams, columns & footings with detailing of reinforcement 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
CE1411.1	2	3	1	2	0	0	0	0	0	0	0	1	3	2	1
CE1411.2	3	3	1	1	0	0	0	0	0	0	0	1	3	2	1
CE1411.3	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CE1411.4	3	3	3	1	0	0	0	0	0	0	0	1	3	2	1
CE1411.5	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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SEMESTER V

Course Code	CE1501							Course category			PC
Course Name	DESIGN OF STEEL STRUCTURES										
Teaching Scheme				Examination Scheme							Credits
Th.	Tu.	Pr.	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	3 hrs.	-	-	100	03

Course Objectives:
The aim of the course is to:

1. Assimilate about the structural steel as a material, structural behavior of steel &structural elements , design philosophies for design of steel structures
2. Analyze and design welded/ bolted connections with detailing as per relevant IS codes
3. Analyze and design tension members, compression members, column splicing with detailing as per relevant IS codes
4. Analyze and design simple beams laterally restrained & laterally unrestrained with detailing as per relevant IS codes
5. Analyze and design slab bases & gusted bases with detailing as per relevant IS codes

.

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, behavior of bolted connections, design strength of ordinary bearing black bolt, simple connection, and moment resistant connection




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Design of tension members:

Types of tension member, factors affecting strength of tension member, design of tension member

Design of compression members:

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

Design of simple beams:

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

Design of column bases:

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

Introduction to earthquake resistant design of steel structures:

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

Text Books:

1. Limit State Design of Steel Structures, Duggal S.K, McGraw Hill Education India. 2019

2. Design of Steel Structures (By Limit State Method as Per IS: 800—2007), S.S. Bhavikatti, I. K. International Pvt. Ltd.

3. Design of Steel Structures: Limit State, N. Subramanian, Oxford University Press, India, 2018

4. Design of Steel Structures, Hirde S. K , Hedaoo M. N., Narosa Publishing House, 2023

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 McCormack 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

Useful Links:

1. https://nptel.ac.in/courses/105/106/105106112/
2. https://www.youtube.com/c/drsuchitahirde/videos

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

CE1501.1: Assimilate about the structural steel as a material, structural behaviour of steel structural elements & design philosophies for design of steel structures.
CE1501.2: Analyze and design welded/ bolted connections with detailing as per relevant IS codes;
CE1501.3: Analyze and design tension members, compression members, column splicing with detailing as per relevant IS codes.
CE1501.4: Analyze and design simple beams laterally restrained & laterally unrestrained with detailing as per relevant IS codes.
CE1501.5: Analyze and design slab bases & gusted bases with detailing as per relevant IS codes.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcome	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1501.1	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CE1501.2	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CE1501.3	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CE1501.4	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1
CE1501.5	3	3	3	2	2	1	0	0	0	0	0	1	3	2	1

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

Mapping as per NBA July 2024 format(w.e.f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1501.1	3	3	3	2	2	1	0	0	0	0	0	3	2	1
CE1501.2	3	3	3	2	2	1	0	0	0	0	0	3	2	1
CE1501.3	3	3	3	2	2	1	0	0	0	0	0	3	2	1
CE1501.4	3	3	3	2	2	1	0	0	0	0	0	3	2	1
CE1501.5	3	3	3	2	2	1	0	0	0	0	0	3	2	1

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

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Course Code	CE1502							Course category			PC
Course Name	GEOTECHNICAL ENGINEERING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Make the students familiar with the various physical and index properties of soil, their relationship, determination and classification of soils for engineering purposes.
2. Introduce to the students the permeability and compaction properties of soil and their applications for field problems.
3. Impart the students the knowledge of shear strength of soil and its determination for varied applications in Civil engineering.
4. Impart the students the ability to determine stress distribution in soil due to various loading condition.
5. Introduce the concept of consolidation and its theory for determination of settlements.

Course Contents:

Introduction and Physical properties of soil:

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

Index properties and classification of Soil:

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

Permeability of Soil and Seepage analysis:

Darcy's law, validity of Darcy's law, factors affecting permeability of soil, Range of coefficient of permeability of common soils, Determination of coefficient of permeability: Laboratory method and field methods, Permeability of stratified soils, Seepage Analysis- stream and potential functions, Flow net, its characteristics, graphical

method to plot flow nets, determination of seepage, Quick condition

Compaction of Soil:
Definition, Importance of compaction, factors affecting compaction, laboratory determination of optimum moisture content and maximum dry density, Standard and modified compaction test, influence of compaction on soil properties, compaction in field, Compaction specification 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

Useful Links:

1. https://nptel.ac.in/courses/105/106/105106142/
2. https://nptel.ac.in/courses/105/103/105103097/

Course Outcomes:

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

CE1502.1: 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;

CE1502.2: determine permeability of soil, and graphically plot the flow net and determine the seepage quantities;

CE1502.3: determine compaction properties of soil and select suitable field method of compaction based on the type of soil;

CE1502.4: 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;

CE1502.5: select suitable test and determine shear strength parameters of different types of soils for various geotechnical analyses;

CE1502.6: explain the basic mechanism of consolidation of soil and evaluate consolidation settlements against time.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1502.1	3	2	1	0	0	0	0	0	0	0	0	1	3	3	1
CE1502.2	3	2	1	0	0	0	0	0	0	0	0	1	3	3	1
CE1502.3	3	3	1	0	0	0	0	0	0	0	0	1	3	3	1
CE1502.4	3	3	1	0	0	0	0	0	0	0	0	1	3	3	1
CE1502.5	3	2	1	0	0	0	0	0	0	0	0	1	3	3	1
CE1502.6	3	2	1	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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Mapping as per NBA July 2024 format(w.e.f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1502.1	3	2	1	0	0	0	0	0	0	0	0	3	3	1
CE1502.2	3	2	1	0	0	0	0	0	0	0	0	3	3	1
CE1502.3	3	3	1	0	0	0	0	0	0	0	0	3	3	1
CE1502.4	3	3	1	0	0	0	0	0	0	0	0	3	3	1
CE1502.5	3	2	1	0	0	0	0	0	0	0	0	3	3	1
CE1502.6	3	2	1	0	0	0	0	0	0	0	0	3	3	1

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

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Course Code	CE 1503(A)	Course category	PE
Course Name	ENGINEERING GEOLOGY		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2hrs 30min.	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Introduce of geology in civil engineering and the Earth's internal structure, plate tectonics, and geological processes.
2. Give Knowledge of properties and classification of minerals, rocks, and structural geological features for engineering applications.
3. Understand groundwater systems, exploration methods, and their engineering significance.
4. Understand Earthquakes, landslides, slope stability, and their mitigation techniques.
5. Understand applications of advanced geological tools in hazard assessment and infrastructure development.

Course Contents:

Introduction: Objective of Study; Scope of subject; Branches of Geology. Importance of geological studies in civil engineering. Internal structure of the Earth and seismic wave applications. Plate tectonics and continental drift. Extenal and Internal Agents; Weathering, Erosion' Denudation & Decomposition. Geological actions of rivers, wind, glaciers, and groundwater.

Earth Materials and Structural Geology: Rock forming and common economic minerals, their chemical composition, physical properties, occurrence and uses. Silicate and its classification. Igneous, sedimentary and metamorphic rocks with reference to their origin, texture, structure and classification. Engineering applications of minerals and rocks in construction and infrastructure. Structural Geology; Study of folds, faults, joints and unconformity with special reference to their classification, genesis and their significance in Civil Engineering Projects like tunneling and slope stability.

Groundwater: Surface and subsurface water advantages and disadvantages, Sources, zones water table, porosity, specific yield and specific retention of water in rocks/aquifers. Artesian groundwater in soil and rock. Factors controlling water bearing capacity of rocks, Pervious and Impervious rocks, Cone of depression and its use in Civil engineering. Geological work of groundwater. Surface and subsurface method of groundwater exploration. Groundwater pollutions and artificial ground water recharge.

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Lowering of water table and subsidence, salt water intrusion in coastal areas.
Earthquakes and Landslides: Earthquake mechanisms, elastic rebound theory, and seismic zones in India. Landslides: causes, types, and mitigation techniques. Slope stability analysis and case studies from the Western Ghats and the Himalayas.

Applications and Advances in Engineering Geology: Applications of engineering geology in the design and construction of tunnels, dams, reservoir, bridge and other civil engineering projects. Advanced geological surveying tools: core drilling, logging, electrical resistivity, and seismic surveys for subsurface exploration and site analysis. Integration of GIS, UAV imagery, and remote sensing technologies for geological hazard mapping, terrain modeling, and risk mitigation in infrastructure development.

Text Books:

1. Parbin Singh, 'Engineering & General Geology', 2014, Katson Educational Series.
2. Krynine & Judd, 'Principles of Engineering Geology and Geotechnics', 2003, CBS Publishers and Distributors.
3. Billings, 'Structural Geology', 1961, Prentice Hall, INC
4. G.W. Tyrrell, 'The Principles of Petrology', John Wiley and Sons, 1975'
5. P.K. Mukherjee, 'A Textbook of Geology', 1978, World Press Pvt. Ltd.
6. F.G. Bell 'Engineering Geology',2014 An imprint of Elsevier

Reference Books:

1. L. G. Berry, B. Maon and R. V. Dietrich, "Mineralogy" ,2014CBS publishers and Distributors
2. Loren A. Raymond, "Petrology: the study of igneous, sedimentary and metamorphic rocks", 2014 McGraw –Hill Higher Education.
3. T. Ramamurthy, "Engineering in Rocks for slopes, foundations and Tunnels", 2010 Second edition PHI learning Pvt. Ltd.

Course Outcomes:

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

CE1503.1: Explain geological processes, Earth's structure, plate tectonics, and their significance in civil engineering.

CE1503.2: Identify and classify minerals and rocks and describe their engineering applications. Analyze geological structures and their impact on tunneling and slope stability

CE1503.3: Assess groundwater systems, exploration methods, and their relevance in civil engineering.

CE1503.4: Understand earthquakes, and landslides, including their causes and mitigation techniques.

CE1503.5: Utilize advanced surveying tools and integrate geospatial data for hazard mapping and site analysis.

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CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1503.1	3	2	1	0	0	2	2	1	0	1	0	2	3	2	0
CE1503.2	3	3	2	0	0	1	0	0	0	1	0	2	3	3	0
CE1503.3	3	3	2	2	2	2	2	1	0	1	0	2	3	2	1
CE1503.4	3	2	3	3	2	1	2	0	0	1	0	2	3	2	1
CE1503.5	3	3	3	3	3	2	3	0	2	3	2	3	3	3	1

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

Mapping as per NBA July 2024 format(w.e.f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1503.1	3	2	1	0	0	2	2	1	0	1	0	3	2	0
CE1503.2	3	3	2	0	0	1	0	0	0	1	0	3	3	0
CE1503.3	3	3	2	2	2	2	2	1	0	1	0	3	2	1
CE1503.4	3	2	3	3	2	1	2	0	0	1	0	3	2	1
CE1503.5	3	3	3	3	3	2	3	0	2	3	2	3	3	1

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

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Course Code	CE1503(B)							Course category				PE
Course Name	ADVANCED SURVEYING											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2hrs 30min.	-	-	100	03

Course Objectives:

The aim of the course is to:

1. 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.
2. Make acquaint students with the knowledge for carrying out special surveys.
3. Make acquaint students with the knowledge for carrying out computations for setting different types of curves for highways.

Course Content:

Use of Advance Surveying and leveling equipment:

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

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

Route Surveying:

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




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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

Special Surveys:
Introduction to Digital Global positioning system (DGPS) : Its working principle, components error in GPS & need for DGPS, types of DGPS : post processing DGPS & Real – time kinematic (RTK), data processing, application of DGPS in civil engineering.

Field Astronomy:
Definitions, co-ordinate systems, terrestrial latitude & longitude

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

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

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

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

References 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.

Useful Links:
1. https://nptel.ac.in/courses/105/104/105104100/

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

CE1503.1: Apply the knowledge, techniques, skills for using advanced surveying

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equipment for engineering and surveying activities.

CE1503.2: Carry out computations for setting different types of curves for highways.

CE1503.3: Apply knowledge for land and property surveying for preparation of maps.

CE1503.4: Apply knowledge of astronomy for solving civil engineering problems.

CE1503.5: Utilize total station, drone and other modern survey instruments.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1503.1	3	1	2	0	0	0	0	0	0	0	0	1	2	3	1
CE1503.2	3	1	2	0	0	0	0	0	0	0	0	1	1	2	3
CE1503.3	3	1	3	0	0	0	0	0	0	0	0	1	1	3	2
CE1503.4	3	1	3	0	0	0	0	0	0	0	0	1	3	1	1
CE1503.5	3	1	1	0	0	0	0	0	0	0	0	2	1	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1503.1	3	1	2	0	0	0	0	0	0	0	0	2	3	1
CE1503.2	3	1	2	0	0	0	0	0	0	0	0	1	2	3
CE1503.3	3	1	3	0	0	0	0	0	0	0	0	1	3	2
CE1503.4	3	1	3	0	0	0	0	0	0	0	0	3	1	1
CE1503.5	3	1	1	0	0	0	0	0	0	0	0	1	3	1

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

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Course Code	CE 1503(C)								Course category			PE
Course Name	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2hrs 30min.	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Make the students acquaint with the fundamental concepts and principles of Remote Sensing (RS) and Geographical Information Systems (GIS).
2. Give Knowledge of types and characteristics of remote sensing data, including spatial, spectral, temporal, and radiometric resolution.
3. Understand processing and analysis of remote sensing imagery, including digital image classification and enhancement techniques.
4. Understand the integration and management of spatial data in GIS, including vectorization, spatial analysis, and network-based modeling.
5. Give Knowledge of applications of RS and GIS in geotechnical investigations, environmental studies, water resources management, disaster risk assessment, and urban planning.

Course Contents:

Fundamentals of Remote Sensing: Definition and scope of remote sensing, Electromagnetic radiation (EMR), electromagnetic spectrum, atmospheric interactions, Spectral signatures of different features (vegetation, water, soil, rock), Remote sensing platforms: Terrestrial, airborne, and spaceborne, Types of sensors: Passive and active sensors, optical, thermal, radar, and LIDAR.

Remote Sensing Systems & Image Interpretation: Terrestrial, airborne, and space borne platforms. Sun-synchronous and geostationary satellites. Earth observation satellites: Landsat, Sentinel, IRS, MODIS, LIDAR, RADARSAT. Indian Remote Sensing (IRS) program. Remote sensing data products: Analog and digital formats. Raster data errors and preprocessing. Resolution: Spatial, spectral, temporal, and radiometric. Multispectral, hyper spectral, and thermal remote sensing. Visual interpretation techniques: Elements, methods, and applications. Relief displacement and vertical exaggeration. Digital Elevation Model (DEM). Role of drones in remote sensing applications

Digital Image Processing: Image pre-processing: Radiometric and

geometric

corrections. Image enhancement techniques (contrast stretching, filtering, band ratio). Image classification: Supervised and unsupervised classification methods. Accuracy assessment and error matrix. Digital Elevation Models (DEMs): Applications in terrain analysis.

Fundamentals of Geographical Information Systems (GIS): GIS data types: Raster and vector. Components of GIS. Vectorization, topology generation, attribute data management, and spatial editing. Spatial analysis techniques: Buffering, overlay, and interpolation. GIS operations using Model Builder and raster calculator. Network analysis and spatial data management. GPS fundamentals: Types, working principles, and applications.

Applications of RS and GIS: Geotechnical investigations: Landslide mapping, soil studies, dam site analysis. Water resource management: Watershed delineation, flood risk mapping. Environmental studies: Land use and land cover (LULC), environmental impact assessment (EIA). Urban and transportation planning. Disaster management and risk assessment.

Text Books:

1. Lillesand, T.M., Kiefer, R.W., & Chipman, J.W., "Remote Sensing and Image Interpretation", Wiley, 2015.
2. Jensen, J.R., "Remote Sensing of the Environment: An Earth Resource Perspective", Pearson, 2013.
3. Chang, K.T., "Introduction to Geographic Information Systems", McGraw Hill, 2015.
4. Richards, J.A., "Remote Sensing Digital Image Analysis: An Introduction", Springer, 2013.
5. Sabins, F.F., "Remote Sensing: Principles and Interpretation", Waveland Press, 2007.

References Books:

1. Gupta, R.P., "Remote Sensing Geology", Springer, 2017.
2. Campbell, J.B. & Wynne, R.H., "Introduction to Remote Sensing", Guilford Press, 2011.
3. Burrough P.A. & McDonnell, R.A., "Principles of Geographic Information Systems", Oxford University Press, 2015.
4. Schowengerdt R.A., "Remote Sensing: Models and Methods for Image Processing", Academic Press, 2007.
5. Cracknell A. & Hayes L., "Introduction to Remote Sensing", CRC Press, 2007.

Course Outcomes:

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

CE1503 (C). 1: Explain the fundamental principles of remote sensing, GIS, and their components.

CE1503 (C). 2: Analyze and interpret remote sensing imagery, satellite data, and geospatial datasets

CE1503 (C). 3: Apply digital image processing techniques for feature extraction and classification

CE1503 (C). 4: Perform spatial analysis in GIS, including overlay, buffering, and interpolation.

CE1503 (C). 5: Utilize RS and GIS techniques in environmental assessment,

hazard mapping, and urban planning.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1503 (C).1	3	2	1	0	1	2	2	1	0	1	0	2	3	2	0
CE1503 (C).2	3	3	2	2	2	2	2	1	0	1	0	2	3	3	1
CE1503 (C).3	3	3	3	3	3	2	2	0	0	1	0	2	3	2	2
CE1503 (C).4	3	2	3	3	3	2	3	0	2	3	2	3	3	3	2
CE1503 (C).5	3	3	3	3	3	2	3	0	2	3	2	3	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1503 (C).1	3	2	1	0	1	2	2	1	0	1	0	3	2	0
CE1503 (C).2	3	3	2	2	2	2	2	1	0	1	0	3	3	1
CE1503 (C).3	3	3	3	3	3	2	2	0	0	1	0	3	2	2
CE1503 (C).4	3	2	3	3	3	2	3	0	2	3	2	3	3	2
CE1503 (C).5	3	3	3	3	3	2	3	0	2	3	2	3	3	1

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

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Course Code	CE1504							Course category			VSE
Course Name	PROFESSIONAL SOFTWARE LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	04	04	-	-	-	-	-	50	--	50	02

Course Objectives:

The aim of the course is to:

1. Make students competent for using various software for analysis and design ofvarious structural elements.
2. Make students competent for using various software for project management.
3. Make students competent for using various software estimating and costing of civilengineering structures.
4. 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:

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(i) **Geotechnical Engineering**: GEO5, PLAXIS 2D, OYASYS Slope - 2D slope stability analysis, OYASYS - Pdisp-3D settlements and stresses, OYASYS- Xdisp- 3D Tunnel settlements and building damage assessment, MIDAS GTS
(ii) **Estimating:** QE-Pro,
(iii) **Project Management**: Microsoft Project 2010, PRIMA VERA, Contractor 6.1. PRISM, SURETRACK
(iv) **Transportation Engineering**: Road Master
(v) **Remote Sensing & GIS**: ArcGIS, GEOMATICA, ERDAS
(vi) **Environmental Engineering**: Neuro Solution
(vii) **Hydraulic Engineering**: LOOP, BRANCH, SEWER, WATER GEM, SEWERGEM & PIPE2012

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

Assessment of Practical Work

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.

Course Outcomes:

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

CE1504.1: Analysis and design of various structural elements using structural engineering softwares.

CE1504.2: Carry out estimate and costing work of Civil Engineering structures.

CE1504.3: Solve the problems in the field of Civil Engineering using various available Civil Engineering softwares.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1504.1	2	2	1	2	3	3	1	2	3	2	2	2	2	3	2
CE11504.2	2	2	1	2	3	3	1	2	3	2	2	2	2	3	2
CE1504.3	2	2	1	2	3	3	1	2	3	2	2	2	2	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1504.1	2	2	1	2	3	3	1	2	3	2	2	2	3	2
CE1504.2	2	2	1	2	3	3	1	2	3	2	2	2	3	2
CE1504.3	2	2	1	2	3	3	1	2	3	2	2	2	3	2

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Course Code	CE1505 (A)							Course category				PE
Course Name	ENGINEERING GEOLOGY LAB											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Understand and identify the various minerals and rocks occurring in nature.
2. Understand and construct geological sections from contoured geological maps.
3. Set out in field, for understanding knowledge of complex geology as needed for Civil Engineering projects.

Course Contents:

It is a representative list of practical's /exercises. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CE1505-A) from the list or otherwise.

Practical Work

I. <u>Mineralogy – Identification of Minerals in Hand Specimens</u>

1. **Identification of Rock Forming Minerals (Silicates):**
   Quartz and its varieties (Amethyst, Chalcedony, Opal), Feldspar group (Orthoclase, Plagioclase), Mica group (Muscovite, Biotite), Zeolites.
2. **Identification of Non-Silicate Minerals:**
   Carbonates (Calcite, Iceland Spar), Sulfates (Gypsum, Satin Spar), Oxides (Magnetite, Hematite, Limonite), Halides (Fluorite), Sulfides (Galena, Pyrite).
3. **Identification of Economic Minerals (Non-Metallic):**
   Graphite, Asbestos, Talc, Kyanite, Barite, Fluorite.
4. **Identification of Economic Minerals (Metallic):**
   Magnetite, Hematite, Limonite, Pyrite, Galena, Chromite, Bauxite, Copper, Manganese, Malachite.

II. <u>Petrology – Identification of Rocks in Hand Specimens</u>

5. **Identification of Igneous Rocks:**

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Plutonic (Granite, Syenite, Diorite, Gabbro), Volcanic (Rhyolite, Andesite, Basalt), Hypabyssal (Pegmatite, Dolerite).

6. **Identification of Sedimentary Rocks:**
   Clastic (Conglomerate, Breccia, Sandstone, Quartzite, Shale), Non-Clastic (Limestone, Dolomite, Laterite).
7. **Identification of Metamorphic Rocks:**
   Foliated (Gneiss, Schist, Slate), Non-Foliated (Marble, Phyllite, Quartzite).

III. Geological, Subsurface, and Geospatial Mapping

Construction of geological sections from contoured geological maps, drill hole problems, 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. Generation of slope, aspect, and contour maps using GIS tools. Overlaying geological, hydrological, and land-use data for hazard assessment.

IV. Field Work (Mandatory)

Geological Field Visit: Study of rock formations, geological structures, and terrain analysis. A field report must be prepared based on observations.

Assessment of Practical Work

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:

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

CE1505 (A).1: Identify natural material like rocks and minerals and know their usage as well as their availability.

CE1505 (A).2: Understand the significance of geological investigations for civil engineering projects and site selection as well as for the preparation of feasibility reports and others.

CE1505 (A).3: Understand the geological maps and language for the discussion on geological reports to resolve civil engineering problems.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1505(A).1	2	1	1	0	0	0	1	0	0	1	0	2	2	2	0
CE1505(A).2	3	2	2	1	1	1	2	1	2	3	0	2	2	2	1

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CE1505(A).3	3	3	3	1	1	2	3	2	2	2	1	2	3	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1505(A).1	2	1	1	0	0	0	1	0	0	1	0	2	2	0
CE1505(A).2	3	2	2	1	1	1	2	1	2	3	0	2	2	1
CE1505(A).3	3	3	3	1	1	2	3	2	2	2	1	3	3	2

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

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Course Code	CE1505 (B)								Course category			PE
Course Name	Advanced survey lab											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. inculcate in the students, the understanding of reinforced concrete and general structural behaviour of RCC structural elements
2. make the students familiar with relevant IS codes related to reinforced concrete design
3. impart the students, the ability to analyze, design and detailing of various reinforced concrete structural members of framed structure according to relevant IS codes

Course Contents:

Practical Work

A. Setting out Curves:

1. Setting out a simple circular curve by offsets from long chord
2. Setting out a simple circular curve by Rankin's method of tangent angle (Deflection angles)

B. Tachometry

1. Computation of horizontal distances and elevations by tachometry for horizontal and inclined sites

C. Total Station:

1. Measuring horizontal and vertical angles, prolonging a given straight line, determination of magnetic bearing of given straight lines
2. Setting out an open traverse with minimum 5 sides using total station and entering the field data and plotting the traverse
3. 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

D. Digital Global Positioning System (DGPS)

1. Conduct a topographic survey of a small area using DGPS & convert a raw DGPS data into a visual map using E- survey cadd software.

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E. Use of Mobile Apps: 1. Use of mobiles apps for various surveying applications

Assessment of Practical Work

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 practical conducted.

Course Outcomes:
On completion of the course, students will be able to:
CE1505.1: Acquire the skill of using advanced surveying equipment such as digital level, digital theodolite and total station for surveying and leveling;
CE1505.2: Set out simple, combined, compound and reverse curves;
CE1505.3: Carry out surveying operations for city and property surveying.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1505.1	3	2	2	0	1	0	0	0	3	3	0	1	3	3	3
CE1505.2	3	1	3	0	3	0	0	1	2	3	0	1	3	3	2
CE1505.3	3	2	2	0	1	0	0	0	3	3	0	1	3	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1505.1	3	2	2	0	1	0	0	0	3	3	0	3	3	3
CE1505.2	3	1	3	0	3	0	0	1	2	3	0	3	3	2
CE1505.3	3	2	2	0	1	0	0	0	3	3	0	3	3	2

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

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Course Code	CE1505(C)							Course category				PE
Course Name	Remote Sensing& & GIS Lab											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Introduce students to different remote sensing data formats and their applications.
2. Understand and apply GIS data handling, including vectorization, attribute management, and spatial analysis.
3. Apply remote sensing and GIS techniques in real-world case studies related to geotechnical, environmental, and water resource management.

Course Contents:

It is a representative list of practical's /exercises. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CE1505-A) from the list or otherwise.

Practical Work: Following is the representative list of experiments-

List of Experiments:

1. Study of remote sensing data formats: Analog and digital data products.
2. Study of Image registration and georeferencing techniques.
3. Study of Digital image enhancement: Contrast stretching, filtering, and band ratio techniques.
4. Study of Image classification methods: Supervised and unsupervised approaches.
5. Study of GIS vector data generation: Digitization, topology creation, and attribute data management.
6. Study of Spatial data analysis in GIS: Buffering, overlay operations, and interpolation.
7. Study of Applications and Ground Truthing: Case studies on water resources, environmental studies, geotechnical investigations, and field visits for GPS-based ground truthing. A field report must be submitted.

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Assessment of Practical Work

ICA - Internal Continuous Assessment shall be based on practical records and skills acquired. Continuous assessment will be conducted for each experiment.

ESE - The End Semester Exam for Practical shall be based on laboratory exercises performed and viva-voce.

Course Outcomes:
On completion of the course, students will be able to:
CE1505(C).1: Identify and analyse different remote sensing data formats and characteristics.
CE1505(C).2: Apply image processing techniques, including enhancement and classification.
CE1505(C).3: Generate and manage spatial data using GIS tools and perform spatial analysis for real-world applications in geotechnical and environmental studies.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1505(C).1	3	3	1	1	2	1	1	0	1	0	1	1	3	2	0
CE1505(C).2	3	2	2	2	3	3	1	0	1	1	1	1	3	3	1
CE1505(C).3	1	3	2	3	3	3	3	1	2	3	2	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1505(C).1	3	3	1	1	2	1	1	0	1	0	1	3	2	0
CE1505(C).2	3	2	2	2	3	3	1	0	1	1	1	3	3	1
CE1505(C).3	1	3	2	3	3	3	3	1	2	3	2	3	3	1

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

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Course Code	CE1506							Course category			PC
Course Name	Design Of Steel Structure Lab										
Teaching Scheme				Examination Scheme							Credits
Th.	Tu.	Pr.	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	02

Course Objectives:
The aim of the course is to:

1. Inculcate in the students, the understanding of the structural planning & general behavior of steel structure.
2. Make the students familiar with relevant IS codes related to steel structure design.
3. Impart the students, the ability to analyze, design and draw structural drawing of simple industrial structure with steel roof truss & various steel structural elements according to relevant IS codes.

Course Contents:

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

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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:

CE1506.1: Evaluate the loads, analyze the structure and determine the design actions in various structural elements of simple industrial structure.

CE1506.2: Design structural elements using relevant IS codes along with connections & carry out detailing (manually/using software).

CE1506.3: write a technical report based on information collected during site visits.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcome	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1506.1	3	3	3	2	2	1	0	0	1	3	0	1	3	3	1
CE1506.2	3	3	3	2	2	1	0	0	1	3	0	1	3	3	1
CE1506.3	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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1506.1	3	3	3	2	2	1	0	0	1	3	0	3	3	1
CE1506.2	3	3	3	2	2	1	0	0	1	3	0	3	3	1
CE1506.3	0	0	0	0	0	0	0	0	0	3	0	0	0	0

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

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Course Code	CE1507								Course category			PC
Course Name	Geotechnical Engineering Lab											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:
The aim of the course is to:

1. Make students familiar with collecting soil sample from the field and preparation of soil samples for various tests on soils.
2. Make students competent to determine the physical and index properties of soil as per IS code procedure.
3. Inculcate in the students skill of conducting permeability and compaction properties of soil.
4. 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 fulfil the course outcomes.

Practical Work:

List of Practical-

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 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 / practical examination based on practical's conducted.

Course Outcomes:

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

CE1507.1: Perform various laboratory experiments to determine physical and index properties of soil and classify soil as per IS codal provisions.

CE1507.2: Determine the permeability of soils by various laboratory tests

CE1507.3: Perform laboratory test to determine the maximum dry density, optimum moisture content of the soil and various shear strength tests.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1507.1	3	2	3	0	1	0	0	0	3	2	0	1	3	3	1
CE1507.2	3	2	3	0	3	0	0	0	3	2	0	1	3	3	1
CE1507.3	3	2	3	0	1	0	0	0	3	2	0	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1507.1	3	2	3	0	1	0	0	0	3	2	0	3	3	1

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CE1507.2	3	2	3	0	3	0	0	0	3	2	0	3	3	1
CE1507.3	3	2	3	0	1	0	0	0	3	2	0	3	3	1

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

Course Code	**CE1551**							**Course category**			**PER**
Course Name	**Research Project Stage – I**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	08	08	00	00	00	00	-	100	00	100	04

Course Objectives:

The aim of the course is to:

1. Gain domain specific knowledge by completing the specific course
2. Collect information on novel and latest development in the specific area of the Civil Engineering.
3. Formulate specific problem statement and design a suitable solution methodology for the problem
4. Develop project management and teamwork skills by planning, executing, and presenting research findings effectively.

Course Contents:

At the beginning of fifth semester, just before the commencement of classes, eligible students can register for the B. Tech, with Honours with Research. The research topic/area selected should have relevance to social needs of society and needs of the industry.

Registered Student will have to discuss with his/her respective guide about the specific area for carrying out the research work. He/she will have to complete the theory courses through online platform such as MOOCs, NPTEL etc. as prescribed by the guide/supervisor, Student will have to

(i) Formulate the specific problem statement,

(ii) Carry out the research literature survey for acquiring in depth knowledge in the chosen domain

(iii) Design a suitable solution methodology for the problem,

(iv) Share the details of literature survey, hypothesis, etc, with the guide

Student will be required to deliver the seminar on the literature survey and proposed research topic at the end of fifth semester

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Student will be required to deliver a seminar based on the work carried out. The ICA includes the assessment on the basis of seminar to be evaluated by the three-member committee comprising of HoD, guide and subject expert from department constituted by the Head of Department.

Course Outcome:

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

CE1551.1: Plan an investigative research problem

CE1551.2: Apply the in-depth knowledge gained in the domain area such as existing methods and their limitations, etc. through literature survey and course attended

CE1551.3: Formulate suitable solution methodology for the research problem

CO – PO – PSO Mapping:

Mapping as per NBA Jan – 2016 Format

CO	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1551.1	2	3	3	0	0	0	0	0	0	0	2	0	0	2	0
CE1551.2	2	0	0	2	3	0	0	0	3	0	0	2	0	0	0
CE1551.3	3	0	3	3	0	2	2	0	0	0	0	0	0	2	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

CO	Program Outcomes and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1551.1	2	3	3	0	0	0	0	0	0	0	2	0	2	0
CE1551.2	2	0	0	2	3	0	0	3	0	2	0	0	0	0
CE1551.3	3	0	3	3	0	2	2	0	0	0	0	0	2	3

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

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Course Code	CE1541								Course category			MN
Course Name	Basics Of Civil Engineering											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Impart the basic knowledge of Civil Engineering and role in Civil Engineer in infrastructure development and various branches / systems of Civil Engineering
2. Introduce various activities in a Civil Engineering Project
3. Understand various construction materials and their applications in construction
4. Understand the Building Planning, drawings and Estimates

Course Contents:

Introduction: Introduction to Civil Engineering, Civil Engineering Projects, Role of Civil Engineer in construction activities, , Importance of Civil engineering in infrastructure development of the country

Investigations: Data collection for planning and design, Topographical investigations – surveying and levelling, Geological Investigations, Geotechnical Investigations, Hydrological Investigations,

Construction materials: Construction materials- Building stones, sand, aggregates, bricks – types and dimensions, Qualities of good bricks, Classification of bricks, cement-types and grades, mortar, P.C.C R.C.C- Grades, Solid and concrete blocks, ACC blocks, Reinforcement- Types and grades, M.S. Rolled steel sections, Aluminium sections, Roof coverings sheets, Flooring Tiles-types, Glass, Aluminium sections, Bitumen, Industrial timber products-veneer, Ply wood, particle board, fiber board, batten board, block board, pre-laminated boards, laminates

Building Planning, drawings and Estimates: Principles of planning, orientation, Introduction to building rules and bye laws, Building area terms-f plinth area and carpet area, Scales, Plan, Elevation, sections, dimensioning, construction notes, symbols for construction materials, Concept of Line plans, site plan and location plan

Units of measurements, Types of estimate- approximate and detailed

Branches of Civil Engineering: Basics of water resources engineering : Types of irrigation schemes,Types of Dams – Gravity dams and earth dams and their suitability, Bandhara

Basics of environmental engineering: Sources of water, Demand of water,

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Quality of water, waste water, Need of water treatment and waste water treatment
Basics of transportation engineering : Modes of Transportation - Roads, railways, bridges, tunnels and airports, docks and harbors , Typical cross sections of roads

Text Books:

1. Ramamrutham, Basic Civil Engineering, Dhanapatrai Publications, New Delhi, 2013
2. Bhavikatti S. S., Basic Civil Engineering, New Age Publication, 2010
3. Gopi S., Basic Civil Engineering, Pearson Education India, 2009
4. B. C. Punmia & Ashok Kumar Jain, Basic of Civil Engineering, Firewall Media, 2003

Reference Books:

1. S.C. Rangwala, Engineering Materials, Charotar Publications, 2008
2. S.C. Rangwala, Engineering Materials, Charotar Publications
3. C. P. Kaushik, Basic of Civil and Environmental Engineering, , New Age Publication
4. M.S. Palanichamy, Basic Civil Engineering, McGraw Hill

Course Outcomes:

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

CE1541.1: Describe importance of Civil Engineering and role of Civil Engineer in infrastructure development

CE1541.2: Explain various types of investigations required for Civil Engineering project

CE1541.3: Describe various building materials and their use/ application in Civil Engineering Constructions

CE1541.4: Explain basics of Civil engineering Planning, drawings and Estimates

CE1541.5: Describe various details related to branches of Civil Engineering

CO – PO – PSO Mapping:

Mapping as per NBA Jan – 2016 Format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1541.2	0	0	0	0	0	1	0	0	0	2	0	2	2	3	1
CE1541.2	0	0	0	0	0	1	0	0	0	2	0	2	2	3	1
CE1541.3	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1
CE1541.4	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1
CE1541.5	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	Program Outcomes and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1541.2	0	0	0	0	0	1	0	0	0	2	0	2	3	1
CE1541.2	0	0	0	0	0	1	0	0	0	2	0	2	3	1
CE1541.3	0	0	0	0	0	1	0	0	0	2	0	2	3	1
CE1541.4	0	0	0	0	0	1	0	0	0	2	0	2	3	1

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CE1541.5	0	0	0	0	0	1	0	0	0	2	0	2	3	1

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

Course Code	**CE1542**							**Course category**			**MN**
Course Name	**Building Construction**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Introduce basic concept of building construction
   Understand various types of buildings according to National Building Code
2. Understand various components of building, their types and functions
3. Impart the knowledge of various construction processes, Special aspects of constructions
4. Give knowledge of 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, Vitrified Tiles

Doors 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

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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

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 & 11/2 brick thick walls), Construction procedure, defects in brick masonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction

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

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. Sushil Kumar, Building Construction, 19th edition, Standard Publishers Distributors, New Delhi.2008
2. P.C. Verghese, Building Materials, , Ist edition, Prentice-Hall of India, New Delhi, 2009.
3 . Saurabh Kumar Soni, S. K. Kataria and Daryaganj,Building Materials and Construction, 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,
3. Building Materials & Components for Developing Countries, C.B.R.I., Tata Mc- Graw Hill Publishing Co. New Delhi, 1990

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4. Gurucharan Singh, Building Construction, 11 th Edition, Standard Book House, New Delhi 2010.

Course Outcomes:

After Completion of course students will be able to:

CE1542.1: Explain various types of Buildings and their suitability
CE1542.2: Classify and explain basic components of building
CE1542.3: Explain the importance and role of each component of building
CE1542.4: Explain various construction processes for various construction works/ components
CE1542.5: Explain temporary structures required for construction of various building components

CO – PO – PSO Mapping:
Mapping as per NBA Jan – 2016 Format

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1542.2	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1542.2	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1542.3	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1542.4	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1542.5	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	Program Outcomes and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1542.2	0	0	0	0	0	0	1	1	2	0	0	0	3	1
CE1542.2	0	0	0	0	0	0	1	1	2	0	0	0	3	1
CE1542.3	0	0	0	0	0	0	1	1	2	0	0	0	3	1
CE1542.4	0	0	0	0	0	0	1	1	2	0	0	0	3	1
CE1542.5	0	0	0	0	0	0	1	1	2	0	0	0	3	1

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

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SEMESTER VI

Course Code	CE1601								Course category			PC
Course Name	Design Of Reinforced Concrete Structure											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	3 hrs	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Inculcate in the students, the understanding of reinforced concrete and general structural behaviour of RCC structural elements.
2. Make the students familiar with relevant IS codes related to reinforced concrete design.
3. 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:

Introduction and Working Stress Method

History of RCC, objectives of analysis & design, properties of concrete and steel, different philosophies of design, working stress method: concept, analysis and design of rectangular beams under flexure using WSM

Limit state method: Introduction

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 Slab

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

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Design of Beams

Design of Rectangular & flanged beams - theory and numerical problems, design for flexure, 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, arial 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 staircases, Design of doglegged Staircase with detailing of reinforcement

Introduction to Earthquake Resistant Design of Structures

Seismic effects on RCC building, material behaviour and general principles of earthquake resistant design of structures, intensity, magnitude, Importance of architectural features in earthquake resistant buildings, short column effect, IS codes, analysis methods, ductile detailing of Earthquake Resistant structures, use of base isolator and dampers to reduce earthquake effect (Numerical examples are not expected)

Text Books

1. Reinforced Concrete Design, Pillai S. U. and Menon Devadas, 3'd Edition, Tata Mc Graw Hill, New Delhi
2. Illustrated Reinforced concrete Design, Shah V. L and Karve S. R., 3'd Edition, Structures Publishers, Pune

References Books

1. Reinforced Concrete Structures – Vol. II, Dr B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi
2. Design of Concrete Structures, Nilson A. H., Darwin D. and Dolan C. W, 3'd edition Tata Mc Graw Hill, New Delhi
3. Fundamentals of Reinforced concrete design, M. L. Gambhir, Prentice Hall of India Private Ltd., New Delhi
4. Limit State Designs of Reinforced Concrete, Varghese P.C.,2nd Edition, Prentice - Hall of India Leaming, New Delhi
5. Fundamentals of reinforced concrete, N. C. Sinha and S. K Roy, 4ft Edition S. Chand Publishers
6. Reinforced concrete design, N. Krishna Raju and R. N. Pranesh, 8s Edition New Age Intonational Publishers, New Delhi
7. BIS:456, "Plain and Reinforced Concrete - Code of Practice", BIS, New Delhi.
8. BIS:875, (Part I to V), "Code of Practice for Design Loads (other than earthquake) for Buildings and Structures", BIS, New Delhi.
9. SP 16, "Design aids for reinforced concrete to IS 456", BIS, New Delhi.
10. BIS 1893 (Part 1), "Criteria for Earthquake Resistant Design of Structures"
11. BIS 13920, "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces-Code of Practice"

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12. SP 24 "Explanatory Handbook of Indian standard code of practice for plain & reinforced concrete", BIS, New Delhi.
13. SP34 "Handbook on concrete reinforcement & detailing (with amendment 1)", BIS, New Delhi

Useful Links:

1. https://www.youtube.com/c/drsuchitahirde
2. https://archive.nptel.ac.in/courses/105/105/105105105/

Course Outcomes :

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

CE1601.1: Explain properties of concrete and steel, general structural behaviour of RCC structural elements and anlyse & design rectangular beams under flexure using WSM

CE1601.2: Analyze and design one way slab, two-way slab and dog legged staircase slab with detailing of reinforcement as per relevant IS codes

CE1601.3: Design rectangular beam, L beam and T beam with detailing of reinforcement as per relevant IS codes

CE1601.4: 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

CE1601.5: Explain the importance of relevant clauses applicable to earthquake resistant RCC structure as per relevant IS codes to reduce earthquake effects

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE2301C.1	3	3	2	0	0	0	0	0	0	0	0	1	3	3	1
CE2301C.2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE2301C.3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE2301C.4	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE2301C.5	3	1	1	0	0	0	0	0	0	0	0	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE2301C.1	3	3	2	0	0	0	0	0	0	0	0	3	3	1

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CE2301C.2	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE2301C.3	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE2301C.4	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE2301C.5	3	1	1	0	0	0	0	0	0	0	0	3	3	1

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

Course Code	**CE1602**						**Course category**			**PC**
Course Name	**Estimating & Costing**									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	-	2hrs 30min.	-	--	100	03

Course Objectives:

The aim of the course is to:

1. Impart the knowledge of measurement of quantities of various components of Civil Engineering structures
2. Impart the knowledge of specification and rate analysis of various items of civil engineering structures
3. Make students capable of preparing estimates of various Civil Engineering structuresas per Specifications and by using current schedule of Rates
4. Impart the knowledge of valuation of building

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 Estimates:

Approximate estimate and detailed estimate, various methods of estimation, Stages of estimates, Purpose and principles, importance of schedule of rates in cost estimates. Study of 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

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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, study of quarry chart and lead statement. Detailed estimate of steel reinforcement in RCC works for Slabs, Beams and Columns,Footings, Stair Case etc., bar bending schedule, detailed estimation for septic tank, soak pit, sanitary and water supply installations.

Specifications:

Purpose, Necessity and principles of specification writing, Types of specifications, Drafting and writing of detailed specifications of important items of construction

Rate analysis:

Importance and need of rate analysis, Factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost. Performance of rate analysis, Analysis of material and labour requirements, Quantity of materials per unit rate of work, labour estimate, and 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, Turnkey contract, target contract, PPP models, built operate transfer, built own operate transfer, C form contract, EPC(Engineering Procurement and Construction) contract, hybrid annuity model Measurement book, nominal muster roll, bill forms, modes of payments to contractor, Classification of contractor and registration of contractors-classes of contractors, documents required for registration

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

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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 :

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

CE1612.1 Prepare quantity estimates for buildings and other Civil Engineering structures as per Specifications;

CE1612.2 Draft detailed specifications and work out rate analysis for all works related to Civil engineering projects;

CE1612.3 Ascertain the quantity of materials required for Civil engineering works as per specifications;

CE1612.4 Prepare cost estimate and valuation of civil engineering works.

CE1612.5 Know about tendering procedure, various types of contract and contract documents

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1612.1	3	0	2	1	0	3	0	0	3	3	3	3	3	3	3
CE1612.2	0	0	3	0	0	2	0	0	3	3	3	3	2	2	3
CE1612.3	3	0	2	1	0	0	0	0	3	3	3	3	3	3	3
CE1612.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3	3
CE1612.5	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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-




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Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1612.1	3	0	2	1	0	3	0	0	3	3	3	3	3	3
CE1612.2	0	0	3	0	0	2	0	0	3	3	3	2	2	3
CE1612.3	3	0	2	1	0	0	0	0	3	3	3	3	3	3
CE1612.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3
CE1612.5	3	2	0	2	0	1	0	3	3	3	3	3	3	3

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

Course Code	**CE1603 (A)**						**Course category**				**PE**
Course Name	**Industrial Wastewater Treatment**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30min.	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Study the effects of discharge of Industrial Wastewater on the environment
2. Study to minimize the problems of Industrial Wastewater
3. Design the various treatment units for Industrial Wastewaters from different industries.

Course Contents:

Problem of Industrial Waste Water: Variation in quality and quantity of industrial wastewater. Effects of discharge of industrial waste water on streams; land and municipal sewers. Benefits of water pollution control by doing treatment of industrial waste.

Indian Standards: for discharge of treated wastewater on land, into municipal sewer and natural water courses.

Sampling Procedure: Industrial waste survey; Stream sanitation, Stream sampling, Types of sampling, Stream survey, Sampling analysis

Approaches to Minimization: For problems of industrial waste water, Good housekeeping, equalization, neutralization, precipitation, mixing of different effluent streams, recycle of effluent streams, 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, Principle of zero discharge

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Different Aspects: For choices of various alternatives such as, treating different effluent streams separately, treating different streams jointly after mixing them partly or fully, Including/excluding domestic waste along with the industrial waste.

General Approach: for handling and treatment of industrial wastewater with following special characteristics

Shock Loads: Due to presence of colours, toxic metal/ions, refractory substances, e.g. A B S and other detergents, growth inhibiting substances such as insecticides, waste rich in nutrients (N.P.K. etc.), waste rich in oil & grease, high suspended solids, high BOD, high temperature, acidity, alkalinity etc.

Treatments: Physico-chemical and biological treatment processes for treatment of the wastewater.

Process Line Diagrams characteristics and treatment of industrial waste of Pulp and paper, textile, tannery, food, Cannings, sugar mill, distillery, dairy, pharmaceutical, electroplating etc. industries. Design of Effluent Treatment Plant

Advanced industrial wastewater treatment: Principles of tertiary treatment, Reuse and resource recovery, recent trends in industrial waste management, Cleaner technologies.

Text Books:

1. Pollution Control in Process Industries, S. P. Mahajan, Tata McGraw-Hill
2. Industrial Water Pollution Control, W.W. Eckenfelder, McGraw-Hill, 1989
3. Environmental Engineering, G. N. Pande, and G. C. Carney, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Reference Books:

1. Waste Water Treatment, Disposal and Reuse, Mctcalf and Eddy, Tata McGraw Hill Publishing Co. Ltd, 1995
2. Liquid Waste of Industry – Theory, Practices and Treatment, Nemerow, Addison-Wesley, 1971.
3. Natural Systems for Waste Management and Treatment, S.C. Reed, E.J.
4. Industrial wastewater Treatment, A.D. Patwardhan. PHI Learning Pvt. Ltd Publication ,New Delhi, 2017
5. Biological Treatment of Waste Waters: W.W. Eckenfelder, Pergamon Press,1961.

Course Outcomes (COs):

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

CE1603 (A).1: Explain and apply the concepts of industrial pollution for sustainable development of industries;

CE1603 (A).2: Identify the effects of discharge of Industrial Wastewater on land and water bodies

CE1603 (A).3: Analyze and evaluate the problems of various industrial

pollutions;

CE1603 (A).4: Apply the knowledge for effective and sustainable treatments of Industrial Wastewaters from different industries

CE1603 (A).5: Design treatment systems to mitigate various industrial pollution.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1603 A.1	3	3	2	0	0	0	0	0	0	0	0	1	3	3	1
CE1603 A.2	2	3	2	0	1	0	0	0	0	0	0	1	1	3	1
CE1603 A.3	3	3	3	2	0	2	2	0	0	0	0	1	3	2	1
CE1603 A.4	1	3	2	0	0	1	0	0	0	0	0	1	1	3	1
CE1603 A.5	3	1	1	0	0	0	0	0	0	0	0	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1603 A.1	3	3	2	0	0	0	0	0	0	0	0	3	3	1
CE1603 A.2	2	3	2	0	1	0	0	0	0	0	0	1	3	1
CE1603 A.3	3	3	3	2	0	2	2	0	0	0	0	3	2	1
CE1603 A.4	1	3	2	0	0	1	0	0	0	0	0	1	3	1
CE1603 A.5	3	1	1	0	0	0	0	0	0	0	0	3	3	1

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

Course Code	CE 1603(B)								Course category			PE
Course Name	Environmental Pollution & Control											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Introduce the students the various aspects of Environmental engineering in general and recent developments in particular.
2. Make acquaint students with various aspects of wastewater engineering problems.
3. Develop competency in students for design of various units of wastewater treatment plant and sewerage system.

Course Contents:

Quantity and Quality of Wastewater

Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal wastewater, First order B.O.D equation,

C.O.D, solids, Quantity of storm water, Ground water infiltration. Self-Purification, DO sag curve, Streeter–Phelps equation, Stream classification, effluents standards for stream and land disposal as per MPCB and CPCB standards.

Sewerage system

Sewage, Types of sewerage system, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems Sewage and Sludge pumping, Location, Capacity.

Primary and secondary treatment of wastewater

Flow diagram of conventional STP, Primary Treatment-Screening, Grit removal, Oil and Grease trap, Primary settling tank

Secondary Treatment-Biological treatment methods, its principle, Activated sludge process- process design and operating parameters, modification of ASP, operational problems, Trickling filter- types and design, Secondary Settling Tank-concept and design**,** Sludge characteristics, Sludge treatment and disposal methods.

Wastewater treatment technologies

Concept of anaerobic digestion, types of reactors. Low cost wastewater treatment methods- Design and

operation of oxidation pond, aerobic & anaerobic Lagoons, Oxidation ditch, Septic tank. Selection of alternative Treatment process flow sheets

Air pollution and Noise pollution

Air Pollution-Definition, Sources and classification of pollutants, Effects on man material and vegetation, Introduction to Meteorological aspects such as atmospheric stability, mixing heights, and plume behaviour, Control of industrial air pollution-Theory and working principle of Settling Chamber, Bag Filters, Cyclone separators, Scrubbers, Electrostatic precipitators, Introduction to global issues – Global warming, Acid rain, Ozone depletion, Photochemical Smog. Ambient air quality standards.

Noise Pollution-Sources and effect of Noise pollution, Noise characteristics and measurements, Levels of noise and standards, control measures of community and industrial noise

Solid waste management

Solid wastes Definition, Types, Sources, Characteristics, Functional outlines-storage, Collection, Processing techniques, Methods of treatment of solid waste-Composting, Incineration, Pyrolysis, and Sanitary landfilling. Concept of Hazardous waste management

Environmental Impact Assessment

Introduction to Environmental Impact Assessment and Environmental Legislation, Environmental Protection act 1986.

Text Books:

1. Environmental Engineering, Peavey, H. S. and Rowe, D.R., McGraw-Hill Book Company
2. Water Supply & Sanitary Engineering, G. S. Birdie, Dhanpat Rai & Sons, New Delhi

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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
3. CPHEEO Manual on sewerage and sewage Treatment, Govt. of India Publication
4. Air Pollution, Rao M. N. and Rao H. V, Tata McGraw Hill
5. CPHEEO Manual on Municipal Solid Waste Management, Ministry of Urban Development, Govt of India
6. Wastewater Treatment plants: Planning, design and operation, Syed R Qusim, CRC Press
7. https://nptel.ac.in/courses/105/104/105104102/

Course Outcomes (COs):

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

CE1603 (B).1: Identify key current environmental problems;
CE1603 (B).2: Identify the effect of the pollutants on the environment: atmosphere, water and soil;
CE1603 (B).3: Plan strategies to control, reduce and monitor pollution;
CE1603 (B).4: Design various units of wastewater treatment process.
CE1603 (B).5: Design & developed waste water technologies.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1603 (B).1	3	1	0	0	0	1	3	0	1	0	0	0	2	1	0
CE1603 (B).2	0	3	1	3	2	0	0	0	0	1	0	1	1	0	0
CE1603 (B).3	2	1	0	0	0	2	2	2	2	2	3	2	2	2	3
CE1603 (B).4	0	0	3	0	2	2	0	1	0	2	0	0	0	1	2
CE1603 (B).5	3	1	1	0	0	0	0	0	0	0	0	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1603 (B).1	3	1	0	0	0	1	3	0	1	0	0	2	1	0

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CE1603 (B).2	0	3	1	3	2	0	0	0	0	1	0	1	0	0
CE1603 (B).3	2	1	0	0	0	2	2	2	2	2	3	2	2	3
CE1603 (B).4	0	0	3	0	2	2	0	1	0	2	0	0	1	2
CE1603 (B).5	3	1	1	0	0	0	0	0	0	0	0	3	3	1

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

Course Code	**CE1603(C)**	**Course category**	**PE**
Course Name	**Advanced Fluid Mechanics**		

Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:
The aim of the course is to:

1. Evaluate instantaneous fluid velocity and track the fluid particles in the flow field, compute flow rate and pumping power of the fluid.
2. Solve benchmark problems using NSE to estimate the velocity profile and shear stress
3. Apply NSE in real time engineering problems to model low and high Reynolds number flow and boundary layer flow.
4. Estimate the total drag and lift forces associated with structures immersed in the fluid
5. Predict the length scale of eddies and Reynolds stress

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Course Contents:

Fundamentals of Fluid Dynamics

Differential approach – the Material Derivative, Integral Approach – RTT, Flow visualization – Path Lines, Streamlines, streak lines, Rate of Deformation, Vorticity and Circulation, The Stream Function Equation, The Vorticity Transport Equation, Conservation Equations – mass, momentum, energy, Boundary Conditions.

Exact Solution of Navier Stokes Equation

Couette (wall–driven) steady flow, Poiseuille (Pressure driven) steady duct flow, and Unsteady Duct Flow

Approximate Solution of Navier Stokes Equation

Creeping flow, inviscid region of flow, Irrotational flow – uniform flow, source, sink, double let, vortex, Hele – Shaw Rankine half body, Rankine Oval, Superposition principle

Boundary Layer Theory

Boundary Layer concept, Boundary layer equations for 2D flows, Blasius Similarity Solution, Karman Momentum integral Equation, Boundary layer thicknesses, Boundary Separation with various pressure gradient, Laminar and Turbulent boundary layers and sports ball dynamics

Flow Over Bodies: Drag And Lift

Drag and Lift, Friction and Pressure Drag, Reducing Drag by Streamlining, Flow Separation, Drag Coefficients of Common Geometries, Parallel Flow over Flat Plates, Friction Coefficient Flow over Cylinders and Spheres, D'Alembert's Paradox. Effect of Surface Roughness, Lift – End Effects of Wing Tips Lift Generated by Spinning

Introduction to turbulence

Nature of Turbulence, Origin of turbulence, Characterization of turbulence,Kolmogorov Hypothesis and Energy Cascade, Reynolds modification of Navier-Stokes equations, Reynolds stresses, Turbulence Models – Prandtl Mixing length Model

Textbooks:

1.Robert W. Fox, Alan T. McDonald, &Philip J., "Fluid Mechanics", 8/e, John Wiley & Sons Inc., 2017

2.K Muralidhar and G Biswas, "Advanced Engineering Fluid Mechanics", 3/e, Narosa Publishing House.,2001

Reference Books:

1.Ronald L. Panton, "Incompressible Flow", 4/e,John Wiley & Sons Inc., 2011

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2.Pijush K. Kundu, Ira M. Cohen,& David M. Dowling, "Fluid Mechanics", 5/e, Academic Press., 2012

3.Yunus A Cengel& John Cimbala, "Fluid Mechanics: Fundamentals and Applications", 3/e McGraw Hill., 2017

Course Outcomes:

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

CE1603.1: Evaluate instantaneous fluid velocity and track the fluid particles in the flow field, compute flow rate and pumping power of the fluid.
CE1603.2: Solve benchmark problems using NSE to estimate the velocity profile and shear stress
CE1603.3: Apply NSE in real time engineering problems to model low and high Reynolds number flow and boundary layer flows
CE1603.4: Estimate the total drag and lift forces associated with structures immersed in the fluid
CE1603.5: Predict the length scale of eddies and Reynolds stress

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1603.1	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2
CE1603.2	3	2	2	2	1	2	2	1	1	3	2	2	2	2	2
CE1603.3	3	3	2	2	2	3	2	1	2	2	2	2	2	2	2
CE1603.4	3	3	2	2	2	3	2	1	2	2	2	2	2	2	2
CE1603.5	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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1603.1	2	2	1	2	1	3	3	2	1	2	2	2	3	2
CE1603.2	3	2	2	2	1	2	2	1	1	3	2	2	2	2
CE1603.3	3	3	2	2	2	3	2	1	2	2	2	2	2	2
CE1603.4	3	3	2	2	2	3	2	1	2	2	2	2	2	2
CE1603.5	3	3	2	2	2	3	2	1	2	2	2	2	2	2

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

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Course Code	CE 1604(A)								Course category			PE
Course Name	**Foundation Engineering**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30min	-	-	100	03

Course Objectives:
The aim of the course is:

1. Make the students familiar with the various methods of soil exploration and their suitability;
2. Impart the students the knowledge of determination of bearing capacity and settlement of foundation from theoretical considerations and results of field tests;
3. Impart the students the knowledge of determination of pile capacity, pile group capacity and settlement by various methods and results of field tests;
4. Impart the students the knowledge of slope stability analysis by various methods;
5. 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

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code, Proportioning of footing for uniform settlement. Soil Stabilization Techniquecs

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

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

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

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

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

Useful Links:

1. https://nptel.ac.in/courses/105/106/105106142/

2. https://nptel.ac.in/courses/105/103/105103097

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

CE1604(A).1: Explain various objectives, and methods of soil exploration and their suitability for engineering projects;

CE1604(A).2: Determine the bearing capacity and settlement of shallow foundation for various field situations, and design the shallow foundations from the given data;

CE1604(A).3: Determine the capacities of pile and pile groups for various field situations and design the pile foundations from the given data;

CE1604(A).4: Determine the stability of given slope by various methods;

CE1604(A).5: Determine the earth pressures and retaining structures for various fields situations and determine the stability of such structures.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1604(A).1	3	2	2	2	0	0	0	0	0	0	0	1	3	3	1
CE1604(A).2	3	2	2	0	2	0	0	0	0	0	0	1	3	3	1
CE1604(A).3	3	2	3	0	3	0	0	0	0	0	0	1	3	3	1
CE1604(A)4	2	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE1604(A).5	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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1604(A).1	3	2	2	2	0	0	0	0	0	0	0	3	3	1
CE1604(A).2	3	2	2	0	2	0	0	0	0	0	0	3	3	1
CE1604(A).3	3	2	3	0	3	0	0	0	0	0	0	3	3	1
CE1604(A)4	2	3	3	0	0	0	0	0	0	0	0	3	3	1
CE1604(A).5	3	3	3	0	0	0	0	0	0	0	0	3	3	1

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

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Course Code	CE 1604(B)								Course category			PE
Course Name	Ground Improvement Technology											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Introduce different issues related to problematic soils and their associated solutions
2. Understand various methods of ground improvement, their principles and field applications.
3. Understand design-techniques for ground improvement methods for different projects.

Course Contents:

Introduction

Major soil deposits in India, Necessity of Ground Improvement, Various mechanisms of Ground Improvement, Classification, Applications, Economic consideration, and suitability

Mechanical modification

Dynamic compaction, impact loading, compaction by blasting, vibro- compaction; pre-compression, Hydraulic modification: dewatering systems, preloading and verticaldrains.

Stone columns

Introduction, layout, function and application, advantages, vibro flotation and rammed technique of stone column installation, Analysis of stone column treated soft soil, unit cell concept, load transfer mechanism, load carrying capacity and settlement analysis, different methods to improve the effectiveness of stone column, strengthening by micro piles.

Soil Stabilization & Chemical modification

Modification by admixtures, Methods of stabilization, mechanical stabilization, stabilization of soil using cement, lime, bitumen, chemical and fly ash stabilization, and stabilization using industrial wastes.
Stabilization/improvement of ground using Geotextiles, Geogrid, Geomembrane, geocells, genets, and soil nails.

Grouting

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

Application of soil reinforcement

Shallow foundations on reinforced earth, design of reinforced earth retaining walls, reinforced earth embankments structures, wall with reinforced backfill, road designs with Geosynthetics.

Text Books:

1. S.K.Gulhati& M Datta, Geotechnical Engineering, Tata McGraw Hill Publishing Company Ltd. 2005
2. P Purushothams Raj, Ground Improvement Techniques, University Science Press, 2011

Reference Books:

1. Foundation Engineering Handbook, HSAI – YANG FANG, CHAPMAN & HILL, New York, 1991
2. Hausmann, M.R., Engineering Principles of Ground Modification, McGraw-Hill InternationalEditions, 1990.
3. Koerner, R. M., Designing with Geosynthetics, Prentice Hall Inc. 1998.

Useful Links:

1. https://onlinecourses.nptel.ac.in/noc21_ce65/preview
2. https://archive.nptel.ac.in/courses/105/108/105108075/

Course Outcomes:

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

CE1604 (B).1 Explain the various mechanisms, classification, applications, and design methodology of Ground Improvement techniques

CE1604 (B).2 Explain various methods of ground improvement, their principles, and applications in the field suitable for sandy soils

CE1604 (B).3 Explain various methods of ground improvement, their principles, and applications in the field for clayey soil

CE1604 (B).4 Explain various types of grouts and methods of grouting, their principles and applications.

CE1604 (B).5 Carry out analysis and design reinforced earth retaining walls, and shallow foundations on reinforced earth

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CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1604(B).1	3	3	3	0	0	0	2	0	0	0	0	1	3	3	3
CE1604(B).2	3	3	2	0	0	0	2	0	0	0	0	1	3	3	3
CE1604(B).3	3	3	2	0	0	0	2	0	0	0	0	1	3	3	3
CE1604(B).4	3	1	2	0	0	0	2	0	0	0	0	1	3	3	3
CE1604(B).5	3	3	3	1	3	0	0	0	0	0	0	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1604(B).1	3	3	3	0	0	0	2	0	0	0	0	3	3	3
CE1604(B).2	3	3	2	0	0	0	2	0	0	0	0	3	3	3
CE1604(B).3	3	3	2	0	0	0	2	0	0	0	0	3	3	3
CE1604(B).4	3	1	2	0	0	0	2	0	0	0	0	3	3	3
CE1604(B).5	3	3	3	1	3	0	0	0	0	0	0	3	3	1

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

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Course Code	CE 1604(C)								Course category			PE
Course Name	Geotechnical Investigation And Construction Practices											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Provide foundational knowledge of subsurface investigation methods and suitability for civil engineering applications.
2. Familiarize students with IS code provisions for essential geotechnical investigations.
3. Equip students with practical skills for construction and ground improvement techniques.

Course Contents:

Geotechnical Investigation

Introduction**,** Planning of subsurface exploration programs, Stages in subsurface exploration, Reconnaissance, lateral extent, and depth of exploration, methods of exploration: trial pits, open excavation, boring.

Types of Boring and Drilling

Auger boring and rotary drilling, Stabilization of boreholes, Soil sample collection: disturbed and undisturbed samples.

Field Tests

Standard Penetration Test (SPT), Plate Load Test (PLT), Electrical Resistivity Test (ERT), Vane shear Test (VST), Cone Penetration Test (CPT).

Soil Investigation Report

Preparation of bore logs and soil profiles, Site investigation in the context of ground improvement.

Geotechnical Construction:

Embankment Construction

Earthmoving and compaction equipment, Methods of quality control and compaction specifications.

Foundations

Overview of shallow foundations, Introduction to pile foundations: driven and bored piles.

Excavation and Groundwater Control

Basics of dewatering methods: sumps, horizontal wells, Vacuum dewatering systems.

Stabilization Techniques

Construction of stabilized roads: lime stabilization and cement stabilization.

Text Books:

1. Geotechnical Engineering: S. K. Gulhati& M. Datta, Tata McGraw-Hill, New Delhi (2005)
2. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor

References Books:

1. Basic and Applied soil mechanics: Gopal Ranjan & A.S. Rao, New Edge Int.

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ltd., (2004)
2. Soil Mechanics in Theory and Practice: Alam Singh, Asia Publisher and Distributor, (1975)
3. Advanced Foundation Engineering: Murthy VNS, CBS publishing, (2007).

Useful Links:
1. https://nptel.ac.in/courses/105105185

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

CE1604 (C).1: Explain various methods of subsurface investigation and their suitability.
CE1604 (C).2: Explain various field tests for subsurface investigation, their suitability and prepare soil exploration report.
CE1604(C).3: Explain construction procedures for embankment, pile foundations, underground constructions and stabilized roads
CE1604(C).4: Apply quality control and safety measures during geotechnical construction.
CE1604(C).5: Apply geotechnical knowledge to solve real-world engineering problems, Integrate investigation data into structural design and risk assessment.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1604(C).1	3	3	2	0	0	0	0	0	0	0	0	1	2	3	1
CE1604(C).2	3	3	3	3	0	0	0	0	0	0	0	1	3	3	1
CE1604(C).3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE1604(C).4	3	3	3	0	0	0	0	0	0	0	0	1	3	3	3
CE1604(C).5	3	1	3	3	0	0	0	0	0	0	0	1	3	3	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1604(C).1	3	3	2	0	0	0	0	0	0	0	0	2	3	1
CE1604(C).2	3	3	3	3	0	0	0	0	0	0	0	3	3	1
CE1604(C).3	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE1604(C).4	3	3	3	0	0	0	0	0	0	0	0	3	3	3
CE1604(C).5	3	1	3	3	0	0	0	0	0	0	0	3	3	3

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

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Course Code	CE1605	Course category	PC
Course Name	Design Of Reinforced Concrete Structure Lab		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Inculcate in the students, the understanding of reinforced concrete and general structural behaviour of RCC structural elements
2. Make the students familiar with relevant IS codes related to reinforced concrete design
3. Impart the students, the ability to analyse, design and detailing of various reinforced concrete structural members of framed structure according to relevant IS codes

Practical Work

PART I:

Analysis and Design of different structural elements of a single storey RCC 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 staircase

Practical report

A lab report consisting of manual designs of structural components of 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 and

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other details collected from site

Assessment of Practical Work

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:

CE1605.1: calculate the load and design forces in various structural elements of RCC building

CE1605.2: submit report on design of RCC structural elements using relevant IS codes along with detailing of reinforcement

CE1605.3: submit a technical report on construction site visit

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1605.1	3	3	2	0	1	0	0	0	3	3	0	1	3	3	3
CE1605.2	3	3	3	0	3	0	0	0	3	3	0	1	3	3	3
CE1605.3	3	3	3	0	1	0	0	0	3	3	0	1	3	3	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1605.1	3	3	2	0	1	0	0	0	3	3	0	3	3	3
CE1605.2	3	3	3	0	3	0	0	0	3	3	0	3	3	3
CE1605.3	3	3	3	0	1	0	0	0	3	3	0	3	3	3

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

Course Code	CE1606								Course category			PC
Course Name	Estimating & Costing Lab											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objective:
The aim of the course is to:

1. Develop the skill of measurement of quantities of various components of civilEngineering structures
2. Develop the skill of drafting of specifications and rate analysis of various items ofcivil engineering structures
3. Make students competent for preparing estimates of various Civil EngineeringStructures as per specifications and by using current schedule of Rates
4. Develop skill of using software e.g. QuePro for preparing detailed estimates.

5.Make students competent for preparing valuation of buildings

Course Contents:

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

Part I:

a. Drafting of Detailed Specifications for any SIX items of construction

b. Detailed estimate of a single / double storied residential building with minimum fourrooms with flat roof (Separate data may be given to each student)

c. Detailed estimate of any one type of bituminous road of minimum 1 km lengthIncluding earthwork, sub-base and base course

d. Detailed estimate of any two of the following:

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i. Septic tank for a colony,
ii. R.C.C framed structure residential building,
iii. Slab Culvert,
iv. A factory shed with steel frame,
v. Underground Water Tank,
vi. Road/Railway track/Runway

e. Analysis of Rates for any SIX items of works
f. Problems based on valuation of existing residential building. (any 2)
g. Working out quantities of steel reinforcement for a column footing, column, beamand slab by preparing bar bending schedule
h. Collecting minimum 3 tender notices for Civil Engineering works and drafting atender notice from given data

Part II:

Study of Que-Pro software/ Bentlay Software/Autodesk software and preparation of detailed estimateof 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:

CE1606.1 Prepare quantity estimates for Buildings and other Civil Engineering structures as per Specifications and current schedule of rates of PWD;
CE1606.2 Draft detailed specifications and work out rate analysis for items of works related to civil engineering projects;
CE1606.3 Determine the quantity of materials required for Civil engineering works as per specifications;

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CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1606.1	3	2	2	2	2	2	0	0	1	2	3	3	3	3	2
CE1606.2	2	0	3	0	0	2	0	0	3	3	3	3	3	2	3
CE1606.3	3	2	2	1	0	0	0	0	3	3	3	3	3	3	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1606.1	3	2	2	2	2	2	0	0	1	2	3	3	3	2
CE1606.2	2	0	3	0	0	2	0	0	3	3	3	3	2	3
CE1606.3	3	2	2	1	0	0	0	0	3	3	3	3	3	3

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

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Course Code	CE1607 (A)							Course category				PC
Course Name	Industrial Wastewater Treatment Lab											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Study the characteristics of Industrial Wastewaters from different industries
2. Apply knowledge to minimize the industrial water pollution
3. Design various units of effluent treatment plant (ETP)

Course Contents

Part A:

Design Problems based on curriculum Related with CE1603 (A) Industrial Wastewater Treatment

Design problems and Design of Effluent treatment plant manually or using Excel / Programming in any Language / Software

Part B:

Report based on field visit to ETP

Assessment of Practical Work

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.

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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:

CE1607.1: Apply the knowledge for effective and sustainable treatments of Industrial Wastewaters from different industries

CE1607.2: Design effluent treatment plant by manually and by using various software

CE1607.3: Submit a technical report on field visit

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1607.1	3	3	2	2	1	0	0	0	3	3	0	1	3	3	3
CE1607.2	3	2	3	0	3	0	0	0	3	3	0	1	3	3	3
CE1607.3	3	3	3	0	1	0	0	0	3	3	0	1	3	3	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1607.1	3	3	2	2	1	0	0	0	3	3	0	3	3	3
CE1607.2	3	2	3	0	3	0	0	0	3	3	0	3	3	3
CE1607.3	3	3	3	0	1	0	0	0	3	3	0	3	3	3

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

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Course Code	CE1607(B)							Course category			PE
Course Name	Environmental Pollution & Control Lab										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Introduce the students the basic concepts of determination of various parameter of water and wastewater
2. Make acquaint students with various laboratory experiments and decide appropriate technology to treat water and wastewater
3. Make students competent to design various treatment units of wastewater treatment plant.

Course Contents

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

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5. Determination of of Acidity and Alkalinity of water sample
6. Determination of sulfate content in water / waste water
7. Determination of optimum dose of coagulant by Jar test
8. Determination of DO of water and wastewater sample
9. Determination of BOD of wastewater sample
10. Determination of COD of wastewater sample
11. Determination of solids of water and Wastewater sample
12. Determination of Sludge Volume Index of wastewater sample
13. Determination of RSPM of air sample by using High Volume Sampler

PART II: Design Problems: Designs of any FIVE treatment units of conventional Sewage Treatment Plant.

PART III: Field visit to WTP / STP: Visit report shall consist of layout of plant, design details such as flow, size etc. along with sketches/drawing of each unit. (based on information collected during visit)

Assessment of Practical Work

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:

CE1607 (B).1: determine various parameters of water and wastewater sample;

CE1607 (B).2: design various units of wastewater treatment plant;

CE1607 (B).3:write a technical report on WTP or STP based on information collected during site visit.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CEU1607.1	3	0	0	2	0	1	0	0	0	0	0	0	2	1	0
CEU1607.2	0	1	0	0	2	0	0	0	0	0	0	1	1	1	0
CEU1607.3	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

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Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CEU1607.1	3	0	0	2	0	1	0	0	0	0	0	2	1	0
CEU1607.2	0	1	0	0	2	0	0	0	0	0	0	1	1	0
CEU1607.3	0	0	2	0	0	2	2	2	1	2	1	0	2	3

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

Course Code	**CE1607(C)**						**Course category**			**PE**
Course Name	**Advanced Fluid Mechanics Lab**									
Teaching Scheme				**Examination Scheme**						**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:
1. Introduce the concept of Reynolds number and its use to classify flows
2. Introduce to the Bernoulli's principle and Stability of floating bodies
3. Understand the flow measurement devices and their principle of operation

Course Contents:

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 CE1603) from the list or otherwise. Minimum 5 experiments should be performed.

1. Determination of critical Reynolds number through visualization of laminar, transition and turbulent flow
2. Verification of Bernoulli's principle through recording of pressure and velocity curves in the venturi meter
3. Determination of stability of floating bodies
4. Determination of coefficient of discharge for venturi, nozzle and orifice meter
5. Analysis of boundary layer flow on a flat plate to

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determine the drag and demonstrate Coanda effect

6. Visualization of flow separation and vortex formation to demonstrate von Karman vortices
7. Visualization and measurement of drag around bodies in potential flow
8. Determination of viscosity and its dependence on temperature.

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 Outcomes:

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

CE1607.1 Introduce to the concept of Reynolds number and its use to classify flows

CE1607.2 Introduce to the Bernoulli's principle and Stability of floating bodies

CE1607.3 Introduce to flow measurement devices and their principle of operation

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1607.1	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2
CE11607.2	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2
CE1607.3	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1607.1	2	2	1	2	1	3	3	2	1	2	2	2	3	2
CE11607.2	2	2	1	2	1	3	3	2	1	2	2	2	3	2
CE1607.3	2	2	1	2	1	3	3	2	1	2	2	2	3	2

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

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Course Code	CE1608 (A)	Course category	PE
Course Name	**Foundation Engineering Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Make students competent for collecting soil sample from the field and preparation of soil samples for various tests on soils
2. Make the students competent for conducting field tests on soil for soil exploration and prepare soil exploration report;
3. Make the students competent for conducting field tests on soil for determination of bearing capacity;
4. Make students competent for design of shallow foundation and pile foundation analytically and using GEO5 software;
5. To make the students competent for determination earth pressure , stability, retaining walls and slope stability analysis

Course Contents:

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

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

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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 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:
CE1608 (A).1 : Conduct field test for soil exploration;
CE1608 (A).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;
CE1608 (A).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;

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1608(A).1	3	2	2	3	1	0	0	0	3	3	0	1	3	3	3
CE1608(A).2	3	1	3	3	1	0	0	1	2	3	0	1	3	3	2
CE1608(A).3	3	2	3	0	2	0	0	0	3	3	0	1	3	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1608(A).1	3	2	2	3	1	0	0	0	3	3	0	3	3	3
CE1608(A).2	3	1	3	3	1	0	0	1	2	3	0	3	3	2
CE1608(A).3	3	2	3	0	2	0	0	0	3	3	0	3	3	2

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

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Course Code	CE1608 (B)								Course category			PE
Course Name	Ground Improvement Technology Lab											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Understand the fundamental principles of ground improvement techniques.
2. Acquire hands-on experience with laboratory tests and equipment related to ground improvement.
3. Develop skills in analyzing and interpreting laboratory test data.
4. Evaluate the effectiveness of various ground improvement techniques, such as compaction, stabilization, and reinforcement.

Course Contents:

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

List of practical

1. Determination of Consistency limits - Liquid limit, Plastic limit, Shrinkage limit
2. Determination of Permeability of soil test by Constant-head test method / Falling-head method.
3. Determination of Compaction properties of soil: Standard Proctor test / Modified Proctor test.
4. Consolidation Test.
5. Cement Stabilization Test: Determine the effectiveness of cement stabilization in improving soil strength.
6. Lime Stabilization Test: Determine the effectiveness of lime stabilization in improving soil strength.
7. Geotextile Reinforcement Test: Demonstrate the effectiveness of geotextile reinforcement in improving soil stability.

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 timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

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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:

CE1608 (B).1 : Ability to conduct laboratory tests for soil properties and ground improvement techniques.

CE1608 (B).2: Ability to analyze and interpret laboratory test data.

CE1608 (B).3: Ability to design and implement ground improvement solutions for real-world problems.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CE1608(B).1	3	2	2	3	1	0	2	0	3	3	0	1	3	3	3
CE1608(B).2	1	1	2	3	3	0	2	1	2	3	0	1	3	3	3
CE1608(B).3	3	2	3	3	1	0	2	0	3	3	0	1	3	3	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1608(B).1	3	2	2	3	1	0	2	0	3	3	0	3	3	3
CE1608(B).2	1	1	2	3	3	0	2	1	2	3	0	3	3	3
CE1608(B).3	3	2	3	3	1	0	2	0	3	3	0	3	3	3

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

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Course Code	CE1608 (C)	Course category	PE
Course Name	Geotechnical Investigation & Construction Practices Lab		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

The aim of the course is to:

1. Make students competent for collecting soil sample from the field and preparation of soil samples for various tests on soils
2. Make the students competent for conducting field tests on soil for soil exploration and prepare soil exploration report;
3. Make the students competent for conducting field tests on soil for determination of bearing capacity and dewatering techniques at on field.

Course Contents:

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

List of practical

Field Investigations

1. Auger Boring : Perform boring and collect soil samples.
2. Standard Penetration Test (SPT) : Conduct SPT at a selected site and analyze N-values.
3. Plate Load Test (PLT) : Determine bearing capacity and settlement characteristics of soil.
4. Electrical Resistivity Test (ERT): Conduct ERT to assess subsurface strata and water table depth.
5. Vane shear Test : To determine the undrained shear strength of cohesive soil, especially in soft clays.
6. Cone penetration test to determine soil resistance & profile of subsoil conditions.
7. Dewatering Techniques: Study sump pumping and vacuum dewatering through site visits or videos.
8. Stabilized Roads : Demonstrate lime stabilization techniques using soil samples

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 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.

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Course Outcome:

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

CE1608 (C).1: Conduct field test for soil exploration;

CE1608 (C).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;

CE1608 (C).3: Select suitable test and determine shear strength parameters of different types of soils for various geotechnical analyses;

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CE1608(C).1	3	2	2	0	0	0	0	0	2	1	0	2	3	3	3
CE1608 (C).2	3	1	3	3	3	0	0	1	2	3	0	2	3	3	2
CE1608(C).3	3	3	2	2	0	0	0	0	2	2	0	2	3	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1608(C).1	3	2	2	0	0	0	0	0	2	1	0	3	3	3
CE1608 (C).2	3	1	3	3	3	0	0	1	2	3	0	3	3	2
CE1608(C).3	3	3	2	2	0	0	0	0	2	2	0	3	3	2

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

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Course Code	CE1609							Course category			FP
Course Name	Minor Project										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	04	04	-	-	-	-	-	50	--	50	02

Course Objectives:

The aim of the course is to:

1. Inculcate in the students, knowledge and skills of identifying a technical problem issue related with Civil Engineering structures, their design, construction methods
2. Inculcate in the students, knowledge and skills of identifying a social problem /issue related with Civil Engineering and finding its solution
3. Equip students with knowledge for finding solutions to technical problems by conducting lab experiments.

Course Contents:

Practical Work:

Any one of the following group projects (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, Net Zero Aspect

iv. Sewerage system project: Data collection for sewage quantity, fixing alignment of

sewers and profile levelling, design of sewers, selection of site for sewage treatment plant, block contouring for treatment plant, preliminary design

v. **Bridge Project:** Hydrological Data collection for project, fixing the location of bridge, River survey at bridge site, preliminary design of bridge.

vi. **Road Project:** Road project of 1 km length including contouring, fixing alignment, design of curves, road geometric design, estimating quantity and cost of project.

B. Public/Society related problem such as Water supply Problem, Irrigation Management problem, Problems related to construction of defective roads and their poor maintenance etc.

The problem should be identified with the help of parent Department such as Water Recourses Department, Jivan Pradhikaran, Public Works Department etc and Project may be taken up to provide the solution to the same with the help of Industrial expert from the parent Department.

C. Finding solution to a technical problem related to Civil Engineering

The problem should be identified either from a literature review or discussing with guides. Project may be taken up to provide the solution to the same by conducting experimental investigations of limited extent.

D. Design of small Civil Engineering structure

The problem should be consists of planning, design, preparation of drawings, preparation of estimates and tendering documents from the available data for a small Civil engineering structure/project such as 3-4 storied residential building, minor irrigation scheme, Rural water supply scheme, rural drainage and sewage collection scheme, rural road project under Pradhan Mantri Gram Sadak Yojana (PMGSY), Planning for a rehabilitation of village affected due to land acquisition.

E. Minor project related to any field / area of Civil Engineering

A report based on above study shall be submitted by group of students

Assessment of Practical:

ICA: Two members committee (out of which one member shall be guide) shall evaluate the performance of students. The Internal Continuous Assessment shall be based on

i) participation of students in group activity,

ii) leadership qualities i.e to accept responsibility to lead the

group of students andtake 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:

CE1609.1 Carry out investigations and collect data for planning and designing of small Civilengineering projects

CE1609.2 Identify a technical problem /issue related with Civil Engineering structures, their design and construction methods

CE1609.3 Find solutions to technical problems by conducting lab experiments.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1609.1	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2
CE1609.2	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2
CE1609.3	2	2	1	2	1	3	3	2	1	2	2	1	2	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1609.1	2	2	1	2	1	3	3	2	1	2	2	2	3	2
CE1609.2	2	2	1	2	1	3	3	2	1	2	2	2	3	2
CE1609.3	2	2	1	2	1	3	3	2	1	2	2	2	3	2

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

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

Course Code	CE 1610							Course category			MNC
Course Name	Disaster Preparedness And Planning For Civil Engineering										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
02	-	-	02	15	15	20	-	-	-	-	50	00

Course Objectives:

The aim of the course is to:

1. Fundamentals of Disaster Management – Concepts of disasters, hazards, risks, vulnerabilities, and mitigation strategies.
2. Types and Impacts of Disasters – Classification of natural and man-made disasters and their socio-economic and environmental impacts.
3. Disaster Risk Reduction and Management – Disaster preparedness, risk assessment, mitigation measures, and emergency response strategies.
4. Policy and Governance Framework – National and international policies, institutional frameworks, and legal aspects of disaster management.
5. Sustainable and Resilient Infrastructure Planning – Integration of disaster resilience and sustainability in infrastructure development and civil engineering practices.

Course Contents:

Introduction

Concepts and definitions: disaster, hazard, vulnerability, risk, resilience. Disaster classification: natural and man-made. Hazard and vulnerability profile of India (seismic zones, flood-prone regions, landslide-prone areas, etc.). Disaster severity, frequency, and magnitude assessment. Prevention, mitigation, and preparedness measures. Role of civil engineers in disaster preparedness and mitigation. Disaster-resistant planning and infrastructure development.

Disasters-Classification, Causes, and Effects

Classification of disasters – Natural disasters: earthquakes, floods, landslides, tsunamis, cyclones, droughts; Man-made disasters: industrial accidents, nuclear hazards, urban flooding, chemical spills, transportation accidents. Causes of disasters – Natural causes: tectonic movements, extreme weather events; Human-induced causes: industrial activities, deforestation, climate change. Effects on civil infrastructure – Structural failures, building collapses, road and bridge damages, dam failures, drainage system disruptions.




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Disaster Risk Reduction and Management

Disaster management cycle – mitigation, preparedness, response, recovery. Structural and non-structural mitigation measures in civil engineering. Design considerations for earthquake-resistant structures, flood-resistant buildings, and landslide prevention techniques. Risk and vulnerability assessment techniques for civil structures. Early warning systems – civil engineering applications in flood and seismic monitoring. Role of geospatial technologies (GIS and Remote Sensing) in disaster management.

Disaster Policy, Institutional Framework, and Infrastructure Governance

Disaster Management Act, 2005 – objectives, legal provisions, implementation. Institutional framework – NDMA, SDMAs, NIDM, international organizations (UNDRR, Sendai Framework). Civil engineering codes and standards for disaster-resistant structures (IS Codes, NBC). Roles and responsibilities of government agencies, municipal bodies, engineers, and contractors in disaster mitigation and urban planning.

Sustainable Infrastructure Planning and Disaster Resilience

Principles of resilient infrastructure design. Disaster-resilient urban planning – land-use planning, zoning regulations, and climate-adaptive design. Sustainable construction materials and techniques for disaster-prone areas. Role of geospatial technology (GIS, Remote Sensing) in disaster planning. Impact of large infrastructure projects (dams, highways, urban expansion) on disaster vulnerability. Case studies of post-disaster infrastructure recovery – rehabilitation of roads, bridges, buildings, and public utilities. Integration of sustainability in disaster recovery and reconstruction.

Text Books:

1. Gupta, H. K. (2003). Disaster Management. Universities Press.
2. Bryant, E. (2005). Natural Hazards. Cambridge University Press.
3. Smith, K., & Petley, D. (2009). Environmental Hazards: Assessing Risk and Reducing Disaster. Routledge.
4. Reddy, M. L. (2010). Geoinformatics for Disaster Management. BS Publications.
5. National Building Code (NBC) and IS Codes for Disaster-Resistant Design.
6. Sendai Framework for Disaster Risk Reduction – UNDRR.

References:

1. Murthy, D. B. N. Disaster Management: Text and Case Studies. Deep and Deep Pvt. Ltd.
2. Goel, S. L. Encyclopedia of Disaster Management. Deep and Deep Pvt. Ltd.
3. Ghosh, G. K. Disaster Management. A P H Publishing Corporation.
4. Modh, Satish. Citizen's Guide to Disaster Management. Macmillan.

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Course Outcomes:

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

CE1610.1: Explain the fundamental concepts of disaster management, including hazards, risks, vulnerabilities, and mitigation strategies in the context of civil engineering.

CE1610.2: Classify different types of natural and man-made disasters and analyze their causes and impacts on civil infrastructure.

CE1610.3: Apply disaster risk assessment techniques and implement structural and non-structural mitigation measures in civil engineering projects.

CE1610.4: Evaluate disaster-related policies, legal frameworks, institutional mechanisms, and engineering standards for disaster-resistant infrastructure.

CE1610.5: Design and integrate sustainable, disaster-resilient infrastructure solutions considering environmental, urban planning, and geospatial technologies.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1610.1	3	2	1	0	1	2	2	1	0	1	0	2	3	2	1
CE1610.2	3	3	2	2	2	2	2	1	0	1	0	2	3	3	2
CE1610.3	3	3	3	3	3	2	2	0	0	1	0	2	3	2	2
CE1610.4	3	2	3	3	3	2	3	0	2	3	2	3	3	3	1
CE1610.5	3	3	3	3	3	2	3	0	2	3	2	3	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1610.1	3	2	1	0	1	2	2	1	0	1	0	3	2	1
CE1610.2	3	3	2	2	2	2	2	1	0	1	0	3	3	2
CE1610.3	3	3	3	3	3	2	2	0	0	1	0	3	2	2
CE1610.4	3	2	3	3	3	2	3	0	2	3	2	3	3	1
CE1610.5	3	3	3	3	3	2	3	0	2	3	2	3	3	1

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

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

Course Code	CE1611	Course category	EX3
Course Name	Construction Management & Safety		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	08	08	-	-	-	-	-	50	-	50	04

Course Objectives:

The aim of the course is to:

1. Define and crystallize a construction project,
2. Apply appropriate planning techniques,
3. Allocate equipment and human resources,
4. Choose & manage safety under different situations.
5. Use safety management to tackle situation

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

Construction Economics & Financial Management

Construction Cost Estimation: Types, methods, and cost control techniques, Budgeting & Financial Planning: Cash flow analysis, cost-benefit analysis, Value Engineering: Concepts, methodology, and application in construction projects,Project Financing: Sources of finance, financial models, and investment appraisal

Construction Safety Management

Introduction to Construction Safety: Importance, principles, and objectives, Hazard Identification & Risk Assessment (HIRA): Techniques for identifying and mitigating risks,Safety in Construction Activities: Working at heights, Scaffolding and ladder safety, Electrical safety, Fire safety and emergency response, Personal Protective Equipment (PPE): Types, usage, and maintenance, Accident Reporting & Investigation: Procedures and corrective actions, Safety Audits and Inspections: Tools, checklists, and documentation

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

Useful Links:

1. https://nptel.ac.in/courses/105/104/105104161/
5. https://nptel.ac.in/courses/105/103/105103206/

Course Outcomes (COs):

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

CE1611.1: Develop project plan and schedule;
CE1611.2: Identify & allocate resources;
CE1611.3: Select and utilize equipment;
CE1611.4: Develop budgeting for construction project using various tools and techniques.
CE1611.5: Use safety management to tackle situation

Member Secretary	BoS Chairperson	Dean Academics	Principal

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1611.1	3	3	2	0	0	0	0	0	0	0	0	1	3	3	1
CE1611.2	2	3	3	0	0	0	0	0	3	0	0	1	3	1	3
CE1611.3	3	3	2	0	0	0	0	0	0	0	0	1	3	3	1
CE1611.4	2	1	3	0	0	0	0	0	0	0	3	1	3	1	2
CE1611.5	3	1	1	0	0	0	2	0	0	0	0	1	3	1	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1611.1	3	3	2	0	0	0	0	0	0	0	0	3	3	1
CE1611.2	2	3	3	0	0	0	0	0	3	0	0	3	1	3
CE1611.3	3	3	2	0	0	0	0	0	0	0	0	3	3	1
CE1611.4	2	1	3	0	0	0	0	0	0	0	3	3	1	2
CE1611.5	3	1	1	0	0	0	2	0	0	0	0	3	1	2

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

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

Course Code	CE1612							Course category			EX3
Course Name	Railway, Airport And Tunnel Engineering										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
	-	08							50	-	-	04

Course Objectives:

The aim of the course is to:

1. Make students familiar with railway engineering fundamentals and functions of railway track operations
2. Design geometry of railway track
3. Choose appropriate railway signals as per the requirements of railway track layout
4. Develop the ability to suggest tunnels and its types
5. Design airport runway and taxiway

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. Modernization in railways and railway track, High speed tracks.

Tunnels:

Necessity, types, tunnel alignment, Size and shape of tunnels, Tunnel lining, drainage, ventilation & lighting of tunnels, Tunneling methods for soft ground and hard ground, method of mucking, drilling, blasting.

Airport:

Agencies controlling national and international aviation, Classification of airports, various surveys to be conducted, airport site selection, Airport layout, Airport obstructions: Zoning laws, imaginary surfaces, approach and turning zone, Airport marking, Airport signaling, Airport lighting,

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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

References 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

Useful Links:
1.https://youtube.com/playlist?list=PLLY_2iUCG87A6xpDI_OJcWynns4e-st5T&si=-nS3bNFkyaXnkkee

Course Outcomes (COs):
After completion of this course, students will be able to:

CE1612. 1: identify, define and formulate a preliminary railway project;

CE1612. 2: design geometrically the railway track;

CE1612.3: explain the functionalities of track operations and use appropriate signals along the track, stations & yards;

CE1612.4: suggest suitable tunnel type for a railway project and road projects.

CE1612.5: explain the design airport components such as runway & taxiway.

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1612.1	3	3	2	0	0	0	0	0	0	0	0	1	3	3	1
CE1612.2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE1612.3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE1612.4	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
CE1612.5	3	1	1	0	0	0	0	0	0	0	0	1	3	3	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1612.1	3	3	2	0	0	0	0	0	0	0	0	3	3	1
CE1612.2	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE1612.3	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE1612.4	3	3	3	0	0	0	0	0	0	0	0	3	3	1
CE1612.5	3	1	1	0	0	0	0	0	0	0	0	3	3	1

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

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

Course Code	CE1613							Course category			EX3
Course Name	**Internship / Technical Project**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	-	-	-	-	-	-	-	100	--	100	08

Course Objectives:

The aim of the course is to:

1. Carry out industry internship / Technical Projects
2. Prepare report of industry internship / Technical Projects

Course Contents:

Industry Internship:

Students must complete Internship for a duration of minimum eight weeks, after completion of fourth semester of second year. The company/organization for Internship must be approved by the DFB. All the official formalities to be completed by the student.

The students should undergo related trainings and perform tasks assigned to him/her in the industry, under the guidance of Industry personnel. The students shall submit the report based on the Industry Internship along with the Completion Certificate given by Industry.

Industry internship may be carried out in any one of the following construction industries:

1) Central Government Department related Civil Engineering

2) State Government Department related to Civil Engineering

3) Private Limited Company related to Civil Engineering

At the end of internship, student should submit the report based on training received during internship and also give presentation for the same to the panel of examiners / Evaluation Committee comprising of Experts appointed by the Program Head.

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

CE1613.1: Prepare report based on Industry internship

CE1613.2: Give presentation based on Industry internship

CE1613.3: Understand the Civil Engineering industry

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CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1613.1	1	3	1	1	1	3	1	1	1	2	1	2	0	0	1
CE1613.2	1	3	1	1	1	3	1	1	1	2	1	2	0	0	1
CE1613.3	1	3	1	1	1	3	1	1	1	2	1	2	0	0	1

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1613.1	1	3	1	1	1	3	1	1	1	2	1	0	0	1
CE1613.2	1	3	1	1	1	3	1	1	1	2	1	0	0	1
CE1613.3	1	3	1	1	1	3	1	1	1	2	1	0	0	1

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

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

Course Code	CE1651							Course category			PER
Course Name	Research Project Stage – II										
Teaching Scheme											Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	12	12	00	00	00	00	-	100	100	200	06

Course Objectives:

The aim of the course is to:

1. Make the students aware and understand research design, including the sampling size and techniques
2. Make the students aware and understand relevant data and analyze it using modern data processing tools/software/Carry out experimentation.
3. Improve the ability of presentation skill and communication technique

Course Contents:

Prepare the research design, including the sampling size and techniques and the statistical tools for the analysis of for the research topic decided in Stage-1 (Fifth Semester).
Collect the relevant data, analyze and interpret the same using modern data processing tool, and test the hypotheses if necessary.
Develop a plan for preparing a report. Publish review paper in peer view journal Scopus indexed/SCI or similar peer reviewed journal.
The faculty guide will assess the method and procedures used by the learner.

Internal Continuous Assessment (ICA):

At the end of semester, the work carried shall be evaluated by three-member committee comprising of HoD, guide and subject expert from department constituted by the Head of Department.

End Semester Examination (ESE):

The internal and external examiner appointed by the competent authority will assess the research work carried out by the student through oral presentation and demonstration (if any).

Course Outcomes:

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

CE1651.1 Analyze and interpret data to produce useful information.
CE1651.2 Show in-depth skill to use some laboratory, modern tools and techniques.
CE1651.3 Communicate results, concepts, analyses and ideas in written and oral form.

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CO – PO – PSO Mapping:
Mapping as per NBA Jan – 2016 Format

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1651.1	0	3	3	3	0	0	2	3	0	0	2	2	0	2	0
CE1651.2	3	0	0	0	3	0	0	0	0	0	0	3	3	0	0
CE1651.3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	Program Outcomes and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1651.1	3	0	3	3	0	0	3	0	0	2	2	0	2	0
CE1651.2	3	0	0	0	3	0	0	0	0	3	0	3	0	0
CE1651.3	0	0	0	0	0	0	0	0	3	0	0	0	0	3

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

Member Secretary **BoS Chairperson** **Dean Academics** **Principal**

Course Code	CE1641								Course category			MN
Course Name	**Building Planning And Drawing**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Impart knowledge to the students about fundamentals of building planning, drawing, IS code provisions, principals of planning and building rules and byelaws,
2. Make students competent to plan residential buildings and public buildings following principles of planning and building rules and byelaws,
3. Develop students to prepare working and submission drawings of buildings

Course Content:

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, 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, 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:

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Building rules and bye-laws for residential buildings, layout for a housing project, alternatives of building types viz. individual bungalows, semi-detached houses, row houses, apartments, Rules governing Plot area, Built-up area, Floor space Index, Building line, Set back, side margins, height of building, Provisions as per NCB, Requirements of drawing as per plan sanctioning authorities, Conversion of agriculture land to non-agriculture land. Planning of layout, Rules to be adopted while developing any layout

Planning of Public Buildings:

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

Text Books:

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

Reference Books:

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

Course Outcomes:

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

CE1641.1 Develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person’s designs;

CE1641.2 Develop working and submission drawings of the building along using principles of planning and building rules and bye-laws;

CE1641.3 Use fundamentals of Building Information Modelling (BIM), Building Plan Management System (BPMS) for building planning and design;

CE1641.4 Examine a design critically and with understanding of CAD to interpret drawings, and to produce designs using a combination of 2D and 3D software;

CE1641.5: develop drawings for conventional structures using practical norms.




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CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1641.1	0	1	0	0	0	1	0	2	3	0	0	3	3	3	3
CE1641.2	0	0	0	1	0	2	0	2	3	3	0	3	3	3	2
CE1641.3	0	0	0	1	3	2	0	0	3	3	0	3	2	3	2
CE1641.4	0	0	0	0	3	0	0	0	2	1	0	2	2	3	2
CE1641.5	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

Mapping as per NBA July 2024 format (w.e.f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1641.1	0	1	0	0	0	1	0	2	3	0	0	3	3	3
CE1641.2	0	0	0	1	0	2	0	2	3	3	0	3	3	2
CE1641.3	0	0	0	1	3	2	0	0	3	3	0	2	3	2
CE1641.4	0	0	0	0	3	0	0	0	2	1	0	2	3	2
CE1641.5	0	0	0	0	0	0	0	0	3	0	2	3	3	3

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

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Course Code	CE1642							Course category			MN
Course Name	Building Estimates And Tendering										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

The aim of the course is to:

1. Impart the knowledge of measurement of quantities of various components of Civil Engineering structures
2. Impart the knowledge of specification and rate analysis of various items of civil engineering structures
3. Make students capable of preparing estimates of various Civil Engineering structures as per Specifications and by using current schedule of Rates
4. Impart skill to use software e.g. QuePro for preparing estimates
5. 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 Stage-I 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, Recapitulation sheet, abstract sheet (BOQ), lead statement, quarry chart.

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, 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. Introduction to software used in estimation.

Specifications:

Purpose, Necessity and principles of specification writing, Types of specifications, Drafting and writing of detailed specifications of important items of construction

Rate analysis:

Importance and need of rate analysis, Factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost. Performance of rate analysis, Analysis of material and labour requirements, Quantity of materials per unit rate of work, labour estimate, various important terminologies like work charged establishment, contingencies, percentage charges, overheads etc.

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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,

Introduction to Contracts tendering:
Contract, Contractor, Types of contracts, Tender notice, Tender documents, tendering procedure, Qualitative and quantitative evaluation of tenders, terms and conditions of contract, Agreement, contract documents, Responsibility of owner, Architect, Contractor and Engineer

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. 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:

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

CE1642.1 Prepare quantity estimates for buildings and other Civil Engineering structures as per Specifications;

CE1642.2 Draft detailed specifications and work out rate analysis for all works related to Civil engineering projects;

CE1642.3 Ascertain the quantity of materials required for Civil engineering works as per specifications;

CE1642.4 Prepare cost estimate and valuation of civil engineering works.

CE1642.5 Prepare draft tender papers.

CO – PO – PSO Mapping:

Mapping as per NBA Jan 2016 format-

Course Outcomes	Program Outcomes and PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1642.1	3	0	2	1	0	3	0	0	3	3	3	3	3	3	3
CE1642.2	0	0	3	0	0	2	0	0	3	3	3	3	2	2	3
CE1642.3	3	0	2	1	0	0	0	0	3	3	3	3	3	3	3
CE1642.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3	3
CE1642.5	3	0	2	1	0	0	0	0	3	1	3	3	2	3	2

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

Mapping as per NBA July 2024 format (w. e. f. 01/01/2025)-

Course Outcomes	PO and PSO													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CE1642.1	3	0	2	1	0	3	0	0	3	3	3	3	3	3
CE1642.2	0	0	3	0	0	2	0	0	3	3	3	2	2	3
CE1642.3	3	0	2	1	0	0	0	0	3	3	3	3	3	3
CE1642.4	3	2	0	2	0	1	0	3	3	3	3	3	3	3
CE1642.5	3	0	2	1	0	0	0	0	3	1	3	2	3	2

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

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