

Curriculum– R23

B.Tech in Civil Engineering

Effective for 2023 Admission Batch Onwards

**L – Lecture; T- Tutorial; P- Practical
[1L=1Cr, 1T=1Cr, 1P =0.5 Cr]**

		1stYear 1stSemester							
Sl.No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE101	Introduction to Civil Engineering	3	0	0	3	3
2	SCI	Multidisciplinary	PH(CE)101	Engineering Physics	3	0	0	3	3
3	SCI	Multidisciplinary	M(CE)101	Engineering Mathematics-I	3	0	0	3	3
4	ENGG	Minor	EE(CE)101	Basic Electric Engineering	3	0	0	3	3
5	HUM	Value added course	HU(CE)101	Environmental science	2	0	0	2	2
6	HUM	Value added course	HU(CE)102	Indian Knowledge System	1	0	0	1	1
B. PRACTICAL									
7	ENGG	Major	CE191	Engineering Graphics & Design Lab	0	0	3	3	1.5
8	SCI	Skill Enhancement Course	PH(CE)191	Engineering Physics Lab	0	0	3	3	1.5
9	ENGG	Minor	EE(CE)191	Basic Electrical Engineering Lab	0	0	3	3	1.5
10	ENGG	Skill enhancement course	HU(CE)191	Technical report writing and language lab	0	0	3	3	1.5
10	HUM	Ability Enhancement Course	HU(CE)192	Competencies in Social Skills	0	0	2	2	1
Total of Theory, Practical and Mandatory Activities/Courses								29	22

***HUM: Humanities; ENGG: Engineering; SCI: Science; MC: Mandatory Activities/Courses**

***‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines**

1 st Year2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE201	Engineering Mechanics	3	0	0	3	3
2	SCI	Multidisciplinary	CH(CE)201	Engineering Chemistry	2	0	0	2	2
3	SCI	Multidisciplinary	M(CE)201	Engineering Mathematics –II	3	0	0	3	3
4	HUM	Ability Enhancement Course	HU(CE)201	Professional Communication	2	0	0	2	2
5	HUM	Value Added Course	HU(CE)202	Values and Ethics	2	0	0	2	2
6	HUM	Value Added Course	HU(CE)203	Constitution of India	1	0	0	1	1
B.PRACTICAL									
7	SCI	Skill enhancement Course	CH(CE)291	Engineering Chemistry Lab	0	0	2	2	1.0
8	ENGG	Skill enhancement Course	ME(CE)291	Workshop & Manufacturing Practices Lab	0	0	3	3	1.5
9	ENGG	Major	CE291	Auto cad Lad	0	0	3	3	1.5
10	HUM	Ability Enhancement Course	HU(CE)292	Professional Communication Lab	0	0	2	2	1
Total of Theory, Practical and Mandatory Activities/Courses								24	18

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines

2 nd Year3 rd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE301	Surveying	3	0	0	3	3
2	ENGG	Major	CE302	Building Materials and Construction	2	0	0	2	2
3	ENGG	Major	CE303	Strength of Materials	3	0	0	3	3
4	ENGG	Major	CE304	Engineering Geology	2	0	0	2	2
5	ENGG	Minor	CS(CE)301	Computer Fundaments and prgramming	3	0	0	3	3
6	ENGG	Minor	CE305	Composite Materials	3	0	0	3	3
		B. PRACTICAL							
6	ENGG	Major	CE391	Surveying Lab	0	0	3	3	1.5
7	ENGG	Major	CE392	Engineering Geology Lab	0	0	3	3	1.5
8	ENGG	Skill enhancement Course	CS(CE)391	Computer Fundaments and prgramming Lab	0	0	3	3	1.5
9	ENGG	Major	CE393	Building Planning and drawing Lab	0	0	2	2	1.0
10	HUM	Ability Enhancement Course	HU(CE)391	Life skill	0	0	1	1	0.5
Total of Theory, Practical and Mandatory Activities/Courses								28	22.0

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2nd Year 4th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE401	Concrete Technology	3	0	0	3	3
2	ENGG	Major	CE402	Structural Analysis	4	0	0	4	4
3	ENGG	Major	CE403	Soil Mechanics	3	0	0	3	3
4	ENGG	Minor	M(CE)401	Numerical Methods	3	0	0	3	3
B. PRACTICAL									
5	ENGG	Major	CE491	Concrete Technology Lab	0	0	3	3	1.5
6	ENGG	Major	CE492	Soil Mechanics Lab-I	0	0	3	3	1.5
7	ENGG	Major	CE493	Quantity Surveying, Specifications and Valuation	0	0	2	2	1.0
8	ENGG	Minor	CS(CE)491	Numerical Methods Lab	0	0	3	3	1.5
9	ENGG	Internship	CE494	Industrial Training (min 1 weeks)	0	0	2	2	1.0
10	HUM	Ability Enhancement Course	HU(CE)491	Quantitative Aptitude: Numerical & Logical reasoning	1	0	0	1	0.5
Total of Theory, Practical and Mandatory Activities/Courses								27	20

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3 rd Year5 th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE501	Structural Design-I	3	0	0	3	3
2	ENGG	Major	CE502	Foundation Engineering	3	0	0	3	3
3	ENGG	Major	CE503	Highway and Transportation Engineering	3	0	0	3	3
4	ENGG	Major	CE504	Environmental Engineering	3	0	0	3	3
5	ENGG	Minor	CE505	Instrumentation & Sensor Technologies for Civil Engineering Applications	4	0	0	4	4
				B. Surveying & Geomatics					
				Application of IOT in civil engineering					
B. PRACTICAL									
6	ENGG	Major	CE591	Soil Mechanics Lab-II	0	0	3	3	1.5
7	ENGG	Major	CE592	Highway and Transportation Engineering Lab	0	0	3	3	1.5
8	ENGG	Major	CE593	Environmental Engineering Lab	0	0	3	3	1.5
9	PROJECT	Minor	PR591	Minor Project-I	0	0	2	2	1
Total of Theory, Practical and Mandatory Activities/Courses								27	21.5

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3 rd Year6 th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE601	Structural Design-II	3	0	0	3	3
2	ENGG	Major	CE602	Construction Planning and Management	3	0	0	3	3
3	ENGG	Major	CE603	Irrigation and Water Resource Engineering	4	0	0	4	4
4	SCI	Minor	CE604	A. Operations Research	4	0	0	4	4
				B. Human Resource Management					
				C. Studies On Six Sigma					
B. PRACTICAL									
5	ENGG	Major	CE691	Structural Design and Detailing Lab	0	0	3	3	1.5
6	ENGG	Major	CE692	Computer Aided Design and Drafting Lab	0	0	2	2	1.0
7	ENGG	Internship	CE693	Industrial Training (Min 2 weeks)	0	0	2	2	1.0
8	PROJECT	Minor	PR691	Minor Project-II	0	0	2	2	1.0
Total of Theory, Practical and Mandatory Activities/Courses								23	18.5

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

4 th Year7 th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE701	Advanced Transportation Engineering	3	1	0	4	4
2	ENGG	Major	CE702	Advanced Structural Analysis	3	0	0	3	3
				Advanced Foundation Engineering					
				Pavement Design					
3	ENGG	Major	CE703	A. Water and Wastewater Engineering	3	0	0	3	3
				B. Hydraulic Structure					
				C. Water Pollution and its Control					
4	SCI	Minor	CE704	A. Human Resource Development and Organizational Behavior	3	0	0	3	3
				B. History of Science & Engineering					
				C. Finite Element Method					
5	HUM	Minor	HU(CE)705	Economics for Engineers	3	0	0	3	3
B. PRACTICAL									
6	PROJECT	Major	PR781	Major Project-I	0	0	8	8	4
7	ENGG	Major	CE782	Internship (Min 1 month)	0	0	2	2	1.0
8	HUM	Ability Enhancement Course	HU(CE)791	Technical Seminar Presentation	0	0	1	1	0.5
9	ENGG	Skill enhancement Course	HU(CE)792	Skill Development : Technical article writing	0	0	1	1	0.5
Total of Theory, Practical and Mandatory Activities/Courses								26	22

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4 th Year8 th Semester									
Sl.No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A. THEORY									
1	ENGG	Major	CE801	A. Structural Dynamics and Earthquake Engineering	3	0	0	3	3
				B. Public Transport System					
				C. Ground Improvement Techniques					
2	ENGG	Major	CE802	A. Bridge Engineering	3	0	0	3	3
				B. Pre-stressed Concrete					
				C. Air & Noise Pollution and Control					
3	ENGG	Minor	CE803	A. Project Management	3	0	0	3	3
				B. Cyber Law and Ethics					
4	HUM	Ability Enhancement Course	HU(CE)801	Principles of Management	2	0	0	2	2
C. PRACTICAL									
5	PROJECT	Major	PR881	Major Project-II	0	0	12	12	6
6	ENGG	Major	CE882	Grand Viva	0	0	2	2	1
Total of Theory, Practical and Mandatory Activities/Courses								25	18

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

Total Credit:

Semester	Without MOOCS
1st	22
2nd	18
3rd	22
4th	20
5th	21.5
6th	18.5
7th	22
8th	18
TOTAL	162

Credit Distribution

Category	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	Total Credit to obtain UG Degree (Category Wise)	Credit Allocation as per NEP to obtain UG Degree	7th Semester	8th Semester	Total Credit (Category Wise)	Credit Allocation as per NEP
Major (Core)	4.5	4.5	14	14	16.5	12.5	66	60	15	13	94	80
Minor Stream	4.5	-	6	4.5	5	5	25	24	6	3	34	32
Multidisciplinary	6	5	-	-	-	-	11	9	-	-	11	9
Ability Enhancement Courses (AEC)	1	3	0.5	0.5	-	-	5	8	0.5	2	7.5	8
Skill Enhancement Courses (SEC)	3	2.5	1.5	-	-	-	7	9	0.5	-	7.5	9
Value Added Courses common for all UG	3	3	-	-	-	-	6	6 to 8	-	-	6	6 to 8
Internship	-	-	-	1	-	1	2	2 to 4	-	-	2	2 to 4
Research Project	-	-	-	-	-	-	-	-	-	-	-	12
Total Credit (Semester Wise)	22	18	22	20	21.5	18.5	122	120	22	18	162	160

Distribution of Subjects under Different Categories

Major Courses

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Introduction to Civil Engineering	CE101	1st	3:0:0	3
2	Engineering Graphics & Design Lab	CE191	1st	0:0:3	1.5
3	Engineering Mechanics	CE201	2nd	3:0:0	3
4	Auto cad Lab	CE291	2nd	0:0:3	1.5
5	Surveying	CE301	3rd	3:0:0	3
6	Building Materials and Construction	CE302	3rd	2:0:0	2
7	Strength of Materials	CE303	3rd	3:0:0	3
8	Engineering Geology	CE304	3rd	2:0:0	2
9	Surveying Lab	CE391	3rd	0:0:3	1.5
10	Engineering Geology Lab	CE392	3rd	0:0:3	1.5
11	Building Planning and drawing Lab	CE393	3rd	0:0:2	1
12	Concrete Technology	CE401	4th	3:0:0	3
13	Structural Analysis	CE402	4th	4:0:0	4
14	Soil Mechanics	CE403	4th	3:0:0	3
15	Concrete Technology Lab	CE491	4th	0:0:3	1.5
16	Soil Mechanics Lab-I	CE492	4th	0:0:3	1.5
17	Quantity Surveying, Specifications and Valuation	CE493	4th	0:0:2	1
18	Structural Design-I	CE501	5th	3:0:0	3
19	Foundation Engineering	CE502	5th	3:0:0	3
20	Highway and Transportation Engineering	CE503	5th	3:0:0	3
21	Environmental Engineering	CE504	5th	3:0:0	3
22	Soil Mechanics Lab-II	CE591	5th	0:0:3	1.5
23	Highway and Transportation Engineering Lab	CE592	5th	0:0:3	1.5
24	Environmental Engineering Lab	CE593	5th	0:0:3	1.5
25	Structural Design-II	CE601	6th	3:0:0	3
26	Construction Planning and Management	CE602	6th	3:0:0	3
27	Irrigation and Water Resource Engineering	CE603	6th	4:0:0	4
28	Structural Design and Detailing Lab	CE691	6th	0:0:3	1.5
29	Computer Aided Design and Drafting Lab	CE692	6th	0:0:2	1
Total for Major Courses up to 3rd Year					66
30	Advanced Transportation Engineering	CE701	7th	3:1:0	4
31	A. Advanced Structural Analysis	CE702	7th	3:0:0	3
32	B. Advanced Foundation Engineering		7th		
33	C. Pavement Design		7th		
34	A. Water and Wastewater Engineering	CE703	7th	3:0:0	3
35	B. Hydraulic Structure		7th		
36	C. Water Pollution and its Control		7th		
37	Major Project-I	PR781	7th	0:0:8	4
38	Internship (Min 1 month)	CE782	7th	0:0:2	1
39	A. Structural Dynamics and Earthquake Engineering	CE801	8th	3:0:0	3
40	B. Public Transport System		8th		

41	C. Ground Improvement Techniques		8th		
42	A. Bridge Engineering	CE802	8th	3:0:0	3
43	B. Pre-stressed Concrete		8th		
44	C. Air & Noise Pollution and Control		8th		
45	Major Project-II	PR881	8th	0:0:12	6
46	Grand Viva	CE882	8th	0:0:2	1
Total for Major Courses up to 4th Year					94

Minor Courses

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Basic Electric Engineering	EE(CE)101	1st	3:0:0	3
2	Basic Electrical Engineering Lab	EE(CE)191	1st	0:0:3	1.5
3	Computer Fundaments and programming	CS(CE)301	3rd	3:0:0	3
4	Composite Materials	CE305	3rd	3:0:0	3
5	Numerical Methods	M(CE)401	4th	3:0:0	3
6	Numerical Methods Lab	CS(CE)491	4th	0:0:3	1.5
7	A. Instrumentation & Sensor Technologies for Civil Engineering Applications	CE505	5th	4:0:0	4
	B. Surveying & Geometrics				
	C. Application of IOT in civil engineering				
8	Minor Project-I	PR591	5th	0:0:1	1
9	A. Operations Research	CE604	6th	4:0:0	4
	B. Human Resource Management				
	C. Studies On Six Sigma				
10	Minor Project-II	PR691	6th	0:0:1	1
Total for Minor Courses up to 3rd Year					25
11	A. Human Resource Development and Organizational Behavior	CE704	7th	3: 0:0	3
	B. History of Science & Engineering				
	C. Finite Element Method				
12	Economics for Engineers	HU(CE)705	7th	3:0:0	3
13	A. Project Management	CE803	8th	3:0:0	3
	B. Cyber Law and Ethics				
Total for Minor Courses up to 4th Year					34

Multidisciplinary Courses

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Engineering Physics	PH(CE)101	1st	3:0:0	3
2	Engineering Mathematics-I	M(CE)101	1st	3:0:0	3
3	Engineering Chemistry	CH(CE)201	2nd	2:0:0	2
4	Engineering Mathematics –II	M(CE)201	2nd	3:0:0	3
Total for Multidisciplinary Courses up to 3rd Year/4th Year					11

Ability Enhancement Courses

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Competencies in Social Skills	HU(CE)192	1st	0:0:2	1
2	Professional Communication	HU(CE)201	2nd	2:0:0	2
3	Professional Communication Lab	HU(CE)292	2nd	0:0:2	1
4	Life skill	HU(CE)391	3rd	0:0:1	0.5
5	Quantitative Aptitude: Numerical & Logical reasoning	HU(CE)491	4th	1:0:0	0.5
Total for Ability Enhancement Courses up to 3rd Year					5
6	Technical Seminar Presentation	HU(CE)791	7th	0:0:1	0.5
7	Principles of Management	HU(CE)801	8th	2:0:0	2
Total for Ability Enhancement Courses up to 4th Year					7.5

Skill Enhancement Courses

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Engineering Physics Lab	PH(CE)191	1st	0:0:3	1.5
2	Technical report writing and language lab	HU(CE)191	1st	0:0:3	1.5
3	Engineering Chemistry Lab	CH(CE)291	2nd	0:0:2	1
4	Workshop & Manufacturing Practices Lab	ME(CE)291	2nd	0:0:3	1.5
5	Computer Fundaments and programming Lab	CS(CE)391	3rd	0:0:3	1.5
Total for Skill Enhancement Courses up to 3rd Year					7
6	Skill Development : Technical article writing	HU(CE)792	7th	0:0:1	0.5
Total for Skill Enhancement Course up to 4th Year					7.5

Value Added Courses

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Environmental science	HU(CE)101	1st	2:0:0	2
2	Indian Knowledge System	HU(CE)102	1st	1:0:0	1
3	Values and Ethics	HU(CE)202	2nd	2:0:0	2
4	Constitution of India	HU(CE)203	2nd	1:0:0	1
Total for Value Added Courses up to 3rd Year/4th Year					6

Internship

SL NO.	Name of the Subject	Subject Code	Semester	L:T:P	Credit
1	Industrial Training (min 1 weeks)	CE494	4th	0:0:2	1
2	Industrial Training (Min 2 weeks)	CE693	6th	0:0:2	1
Total for Internship up to 3rd Year/4th Year					2

Department: Civil
Engineering Curriculum
Structure &
Syllabus for BTech in Civil Engineering
(Effective from 2023-24 admission batch)

		1stYear 1stSemester							
Sl.No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE101	Introduction to Civil Engineering	3	0	0	3	3
2	ENGG	Minor	EE(CE)101	Basic Electrical & Electronics Engineering	3	0	0	3	3
3	SCI	Multidisciplinary	PH(CE)101	Engineering Physics	3	0	0	3	3
4	SCI	Multidisciplinary	M(CE)101	Engineering Mathematics-I	3	0	0	3	3
5	HUM	Value added course	HU104	Environmental science	2	0	0	2	2
6	HUM	Value added course	HU105	Indian Knowledge System	1	0	0	1	1
B.PRACTICAL									
1	ENGG	Major	CE191	Engineering Graphics & Design Lab	0	0	3	3	1.5
2	ENGG	Minor	EE(CE)191	Basic Electrical & Electronics Engineering Lab	0	0	3	3	1.5
3	HUM	Ability Enhancement Course	HU(CE)191	Competencies in Social Skills	0	0	2	2	1
4	SCI	Skill Enhancement Course	PH(CE)191	Engineering Physics Lab	0	0	3	3	1.5
5	ENGG	Skill enhancement course	HU(CE)192	Technical report writing and language lab	0	0	3	3	1.5
Totalof Theory andPracticalCourses								29	22

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COURSE NAME: INTRODUCTION TO CIVIL ENGINEERING
COURSE CODE: CE101
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36
CREDITS: 3

Prerequisites: A basic knowledge in 10+2 Science subjects.

Course Objective:

The concepts developed in this course will aid in quantification of several concepts in Civil Engineering based on previous knowledge of science at the 10+2 levels in schools. Technology is being increasingly based on the basics of Civil Engineering, broad areas of Civil Engineering and their application.

Course Outcomes (COs):

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

CO1: Describe the fundamentals of Civil Engineering and their broad areas.

CO2: Apply fundamental concepts of Civil Engineering in different engineering applications.

CO3: Apply the knowledge of various specializations and concept of Civil Engineering to different industries.

CO4: Evaluate theoretical and practical aspects related to the various aspects of Civil Engineering in Structural Engineering, Soil Engineering, Transportation Engineering, Water Resource Engineering, Environmental Engineering, etc. to the industrial scale, in accordance with current needs.

COURSE CONTENT –

Module 1: Introduction and Scope of Civil Engineering: 2L

Function of Civil Engineering, Broad disciplines of Civil Engineering; Impact of Infrastructural Development on the Economy of a Country; Importance of Civil Engineering; Possible scopes for a career in Civil Engineering

Module 2: History and Fundamentals of Civil Engineering – 4L

Relevance of Civil Engineering in the overall infrastructural development of the country. Types and classification of structures - buildings, towers, chimneys, bridges, dams, retaining walls, water tanks, silos, roads, railways, runways and pipelines (Brief description only) - Definition and types of buildings as per National Building Code of India (brief description only) - Selection of site - Components of a building and their functions – Setting out of a building.

Module 3: Introduction to building Materials: 4L

Cement: Basic Ingredients — Manufacturing process - Grades – Properties - Uses, Aggregates: Fine and coarse aggregate - Properties – Uses; Brick Masonry: Types - Bond - Introduction to all types of bonds; Introduction to stone masonry, Timber:

Properties - Uses - Classification - Seasoning - Defects - Preservation; Hard board and Particle board - Manufacture and use; Steel: Structural steel and steel as reinforcement - Types - Properties - Uses - Market forms; Floors and Flooring materials: Different types and selection of floors and floor coverings; Roofs and roof coverings: Different types of roofs - Suitability – Types and selection of roofing materials.

Module 4: Elements of Building Construction & Planning:4L

General Requirement of Building, Elementary principles and basic requirements of a building Planning, Importance of Planning, Layout of residential & industrial buildings, Introduction to Plan, Elevation & Section of Residential Building Construction: Classification of buildings based upon occupancy, Types of Structures, Design Loads acting on the structure, Elements of building drawing.

Module 5: Fundamentals of Surveying: 3L

Introduction, Basic Definitions (Surveying, levelling, Plans, Maps, Scales), Introduction to divisions of surveying, Classification of surveying, Fundamental principles of surveying, Measurement in Surveying, Phases of Surveying.

Module 6: Fundamentals of Structural Engineering: 4L

Objective of Structural Engineering, Types of Loads on Structure, Types of structure, Structural idealization, Load paths in structures, Characteristics of force system, Moments and Reactions, Types of Structural Members, Column and Footing, Types of beams, Types of slabs, Fundamentals of support and reactions

Module 7: Fundamentals of Geotechnical Engineering: 4L

Introduction to Geotechnical Engineering, Nature of Soil and rock materials, Approach to study Geotechnical Engineering, Soil formation and nature of soil Constituents, Introduction and classification properties of soils, Basic definitions and Phase relations

Module 8: Introduction to Transportation Engineering:4L

Role of Transportation in National development, Transportation Ways and mode of transport, Surface Transportation and Aviation, Introduction to Railway Engineering, Elements of Traffic Engineering and Traffic Control.

Module 9: Environmental Engineering & Sustainability: 4L

Sustainability Concepts – Innovations and Challenges; Environmental Measurements from Different Disciplines; Water – Quantity and Quality; Water Treatment Basics; Basics of Wastewater Collection, Treatment & Resource Recovery; Basics of Solid Waste, Soil and Noise Pollution; Basics of Air Pollution Issues – Global and Local

Module 10: Fundamentals of Water Resources Development:3L

Elementary Hydrology, Sources of water, Watershed Development, Water requirements and its conservation, Basic Introduction of Hydraulic Structures of Storage.

Reference Books-

- 1) Chen, W. F. and Liew, J. Y. R., (Eds.), The Civil Engineering Handbook, Second Edition, CRC Press (Taylor and Francis)
- 2) Dalal, K. R., Essentials of Civil Engineering, Charotar Publishing House
- 3) Gopi, S., Basic Civil Engineering, Pearson Publishers
- 4) Kandya, A. A., Elements of Civil Engineering, Charotar Publishing house
- 5) Mamlouk, M. S. and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.
- 6) McKay, W. B. and McKay, J. K., Building Construction Volumes | to 4, Pearson India Education Services

- 7) Rangwala, S. C. and Dalal, K. B., Engineering Materials, Charotar Publishing house
- 8) Rangwala, S. C. and Dalal, K. B., Building Construction, Charotar Publishing house

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	3	2	1	-	-	-	-	-	-	2	2
CO2	3	3	2	1	-	-	-	-	-	-	2	2
CO3	3	2	2	1	-	-	-	-	-	-	1	2
CO4	2	3	2	1	-	-	-	-	-	-	2	1

PAPER NAME: ENGINEERING PHYSICS

PAPERCODE: PH(CE)101

CONTACT:3:0:0

TOTAL

CONTACT

HOURS: 36

CREDIT:3

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objectives:

The aim of course is to provide adequate exposure and develop insight about the basic principles of physical sciences and its practical aspects which would help engineers to learn underlying principles of various tools and techniques they use in core engineering and related industrial applications. The course would also inculcate innovative mindsets of the students and can create awareness of the vital role played by science and engineering in the development of new technologies.

Course Outcomes (COs):

After attending the course students should be able to

COs	Description
CO1	Explain basic principles of laser, optical fiber and holography.
CO2	Understand the properties of Nano material and semiconductor.
CO3	Understand standard measurement methods that are used in building acoustics.
CO4	Analyze different crystallographic structures according to their co-ordination number and packing factors.
CO5	Justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics.

Course Content:

Module 1 (12L)

Modern Optics

1.01- Laser: Concepts of various emission and absorption processes, Einstein A and B coefficients and

equations, working principle of laser, metastable state, population inversion, condition necessary for active laser action, optical resonator, illustrations of Ruby laser, He-Ne laser, Semiconductor laser, applications of laser, related numerical problems.

6L

1.02-Fibre optics-Principle and propagation of light in optical fibers (Step index, Graded index, single and multiple modes) - Numerical aperture and Acceptance angle, Basic concept of losses in optical fiber, related numerical problems.

3L

1.03-Holography-Theory of holography, viewing of holography, applications 3L

Module 2 (6L)

Solid State Physics

2.01 Crystal Structure: Structure of solids, amorphous and crystalline solids (definition and examples), lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, simple cubic, fcc and bcc lattices, Miller indices and miller planes, co-ordination number and atomic packing factor, Bragg's equation, applications, numerical problems. 3L

2.02 Semiconductor: Physics of semiconductors, electrons and holes, metal, insulator and semiconductor, intrinsic and extrinsic semiconductor, p-n junction. 3L

Module 3 (8L)

Quantum Mechanics

3.01 Quantum Theory: Inadequacy of classical physics-concept of quantization of energy, particle concept of electromagnetic wave (example: photoelectric and Compton Effect; no derivation required, origin of modified and unmodified lines), wave particle duality; phase velocity and group velocity; de Broglie hypothesis; Davisson and Germer experiment, related numerical problems. 4L

3.02 Quantum Mechanics 1: Concept of wave function, physical significance of wave function, probability interpretation; normalization of wave functions- Qualitative discussion; uncertainty principle, relevant numerical problems, Introduction of Schrödinger wave equation (only statement). 4L

Module 4 (4L)

Physics of Nanomaterials

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Quantum size effect and Quantum confinement. Carbon allotropes. Application of nanomaterials (CNT, graphene, electronic, environment, medical).

Module 5 (6L)

Building Acoustics, Ultrasound and infrasound

5.01: Building Acoustics: Introduction, bel, decibel-their physical significance, Reverberation, reverberation time, Sabine's formula (statement only), remedies over reverberation; Absorption of sound, absorbent materials; Conditions for good acoustics of a building; Noise, its effects and remedies. 2L

5.02: Ultrasound-Introduction, definition and properties –Production of ultrasonics by Piezo-electric crystal and magnetostriction method; Detection of ultrasonics; Engineering applications of Ultrasonics (Non-destructive testing, cavitations, measurement of gauge). Infrasound – Introduction and definition, production, application: Seismography (concept only). 4L

Recommended Text Books for Physics I:

Text Books:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Engineering Physics (Vol. 1, Vol. 2)-S.P. Kuila (S. Chand Publishers).
3. Perspective & Concept of Modern Physics -Arthur Baiser (Publisher: McGrawhill)

4. Principles of engineering physics – Md. N Khan and S Panigrahi (Cambridge University Press).
5. Concepts of Modern Engineering Physics-A. S. Vasudeva. (S. Chand Publishers)
6. Engineering Physics (Vol. 1, Vol. 2)-S.P. Kuila (S. Chand Publishers).
7. Physics Volume 1&2 - Haliday, Resnick & Krane, Publisher: Wiley India).
8. Engineering Physics-B. K. Pandey And S. Chaturvedi (Publisher: Cengage Learning, New Delhi).

Recommended Reference Books for Physics I:

Modern Optics:

1. A text book of Light-Brijlal & Subhramaniam, (S. Chand publishers).
2. Optics-Ajay Ghatak (TMH)

Solid State Physics:

1. Solid state physics- S. O. Pillai.
2. Introduction to solid state physics-Kittel (TMH).

Quantum Mechanics:

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House).
2. Quantum mechanics -A.K. Ghatak and S Lokenathan

Physics of Nanomaterials

1. Introduction to Nanotechnology, B.K. Parthasarathy.
2. Introduction to Nanoscience and Nanotechnology, An Indian Adaptation-Charles P. Poole, Jr., Frank J. Owens.

Ultrasound and Infrasound

1. Principles of Accoustics -B. Ghosh (Sreedhar Publishers)
2. A Treatise on Oscillations, Waves and Acoustics-D. Chattopadhyay.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	--	--	--	--	--	--	--	2
CO2	3	3	2	2	--	--	--	--	--	--	--	2
CO3	3	3	2	2	--	--	--	--	--	--	--	2
CO4	3	2	2	2	--	--	--	--	--	--	--	1
CO5	3	3	3	2	2	--	--	--	--	--	--	1

COURSE NAME: ENGINEERING MATHEMATICS-I

COURSECODE: M(CE)101

CONTACT:3:0:0

TOTAL

CONTACT

HOURS:

36CREDITS:3

Prerequisite: The students to whom this course will be offered must have the concept of (10+2) algebra and calculus.

Course objectives: Knowledge of Mathematics up to 12th standard.

Course Outcomes (COs):

On successful completion of the learning sessions of the course, the learner will be able to

CO1: Recall the properties and formula related to Matrix Algebra, Differential Calculus and Laplace Transforms

CO2: Determine the solutions of the problems related to Matrix Algebra, Differential Calculus and Laplace Transforms

CO3: Apply the appropriate mathematical tools of Matrix Algebra, Matrix Algebra, Differential Calculus and Laplace Transforms

CO4: Analyze different engineering problems linked with Matrix Algebra, Matrix Algebra, Differential Calculus and Laplace Transforms

Course Content:

Module-I: Matrix Algebra (10)

Echelon form and Normal (Canonical) form of a matrix; Inverse and rank of a matrix; Consistency and inconsistency of system of linear equations, Solution of system of linear equations; Eigenvalues and eigenvectors, Cayley-Hamilton theorem.

Module II: Differential Calculus (12)

Function of several variables, Concept of limit, continuity and differentiability; Partial derivatives, Total derivative and its application; Chain rules, Derivatives of implicit functions Euler's theorem on homogeneous function, Jacobian. Maxima and minima of functions of two variables

Module III: Laplace Transform (LT): (14 Lectures)

Improper integrals; Beta and Gamma functions and their properties. Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property, LT of $tf(t)$, LT of $\frac{f(t)}{t}$, LT of

Text Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,

- ### Reference Books:

1. Bronson, R., Schaum's Outline of Matrix Operations. 1988.

<div><div></div><div>P0</div></div>	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11
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COURSENAME: BASICELECTRICALENGINEERING

COURSECODE: EE(CE)101

CONTACT: 3:0:0

TOTAL

CONTACT

HOURS: 36

CREDITS: 3

PREREQUISITES: Analysis, Knowledge of calculus, statistics, differential equations, Fourier transformation, basics of mechanics and electrodynamics.

COURSEOBJECTIVE:

To impart basic knowledge of electrical quantities and provide working knowledge for the analysis of DC and AC circuit.

To understand the construction and working principle of DC and AC machine

To facilitate understanding of basic electronics and operational amplifier circuits

COURSEOUTCOMES(COS):

CO	Statement
-----------	------------------

- | | |
|-----|--|
| CO1 | Apply fundamental concepts and circuit laws to solve simple DC electric circuits |
| CO2 | To solve simple ac circuits in steady state |
| CO3 | Impart the knowledge of Basic Electronics Devices and ICs. |
| CO4 | Analyze the simple electronics circuits |

MODULE 1: Elementary Concepts of Electric Circuits

6L

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

MODULE 2: Electrical machine

8L

Transformer: Magnetic materials, BH characteristics, ideal and practical

transformer, equivalent circuit, losses in transformers, regulation and efficiency.

DC Machines: Brief idea on constructional features, classifications, working principle of both motor and generator. Simple problems on Voltage equation.

MODULE 3: Fundamentals of Semiconductor Devices:

6L

Introduction to Semiconductor: Concept of energy band diagram; Comparison among metal, insulator, semiconductor; Semiconductors-classifications and Fermi energy level; Charge neutrality and Mass-Action law in semiconductor; Current flow in semiconductor due to drift & diffusion process; Einstein relation.

MODULE 4: PN Junction Diode:

4L

Principle of operation; V-I characteristics; principle of avalanche & Zener breakdown; Junction resistances and capacitances; V-I characteristics of Zener diode.

MODULE 5: Bipolar Junction Transistors:

4L

PNP and NPN structures; Principle of operation; Current gains in CE, CB and CC mode; input and output characteristics; Biasing & Stability Analysis- Concept of Fixed Bias, Collector to base Bias & voltage divider bias.

MODULE 6: Introduction to IC:

8L

Integrated circuit-Basic idea, classifications, advantages, disadvantages; OPAMP(IC741)-Pin configuration and equivalent circuit; Characteristics of OPAMP(IC741); Inverting & Non-Inverting Amplifier; Adder, Subtractor, Differentiator & Integrator Circuit.

Textbooks:

1. A Textbook of Electrical Technology - Volume I (Basic Electrical Engineering) & Volume II (AC & DC Machines)-B. L. Theraja & A.K. Theraja, S. Chad, 23rd Edition, 1959
2. D. Chattopadhyay, P.C. Rakshit, "Electronics Fundamentals and Applications", New Age International (P) Limited Publishers, Senenth Edition, 2006
3. Basic Electrical & Electronics Engineering by J.B. Gupta, S.K. Kataria & Sons, 2013
4. Basic Electrical and Electronics Engineering-I by Abhijit Chakrabarti and Sudip Debnath, McGraw Hill, 2015
5. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.
6. DP Kothari and IJ Nagrath, "Basic Electrical & Electronics

Engineering”, Tata McGraw Hill,2020.

Reference Books

1. DC Kulshreshtha, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. T.K. Nagsarkar, M.S. Sukhija, “Basic Electrical Engineering”, Oxford Higher Education.
3. Hughes, “Electrical and Electronic Technology”, Pearson Education”.
4. Parker and Smith, “Problems in Electrical Engineering”, CBS Publishers and Distributors.
5. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.
6. Bernard Grob, Basic Electronics, McGraw Hill.
7. Chinmoy Saha, Arindham Halder and Debarati Ganguly, Basic Electronics- Principles and Applications, Cambridge University Press, 2018.

CO-PO Course Articulation Matrix Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	3	2	1	-	-	-	-	-	-	2	2
CO2	3	3	2	1	-	-	-	-	-	-	2	2
CO3	3	2	2	1	-	-	-	-	-	-	1	2
CO4	2	3	2	1	-	-	-	-	-	-	2	1

COURSENAME:ENVIRONMENTALSCIENCE**COURSECODE:HU(CE)101****CONTACT:2:0:0****CONTACT HOURS: 24****CREDIT: 2****Pre-requisites: NIL**

Course Objective(s): This course will enable the students to,

- Realize the importance of environment and its resources.
- Apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- Know about environmental laws and regulations to develop guidelines and procedures for health and safety issues.
- Solve scientific problem-solving related to air, water, land and noise pollution.

Course Outcomes (COs):

CO	Statement
C01	Able to understand the natural environment and its relationships with human activities
C02	The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk
C03	Ability to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues
C04	Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

Module 1 - Resources and Ecosystem (6L)**1. Resources (2L)**

Types of resources, resistance to resources, Human resource, Population Growth models: Exponential Growth, logistic growth

2. Ecosystem (3L)

Components of ecosystem, types of ecosystems, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Food chain, Food web.

3. Energy and Environment(1L)

Conventional energy sources, coal and petroleum, Green energy sources, solar energy, tidal energy, geothermal energy, biomass

Module 2 – Environmental Degradation (9L)**1. Air Pollution and its impact on Environment (3L)**

Air Pollutants, primary & secondary pollutants, Criteria pollutants, Smog, Photochemical smog and London smog, Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion.

2. Water Pollution and its impact on Environment (3L)

Water Pollutants, Oxygen demanding wastes, heavy metals, BOD, COD, Eutrophication, Hardness, Alkalinity, TDS and Chloride, Heavy metal poisoning and toxicity.

3. Land Pollution and its impact on Environment (2L)

Solid wastes, types of Solid Waste, Municipal Solid wastes, hazardous wastes, bio-medical wastes, E-wastes

4. Noise Pollution and its impact on Environment (1L)

Types of noise, Noise frequency, Noise pressure, Noise intensity, Noise Threshold limit, Effect of noise pollution on human health.

Module 3 – Environmental Management (6L)**1. Environmental Impact Assessment (1L)**

Objectives of Environmental management, Components of Environmental Management, Environmental Auditing, Environmental laws and Protection Acts of India

2. Pollution Control and Treatment (2L)

Air Pollution controlling devices, Catalytic Converter, Electrostatic Precipitator, etc., Waste Water Treatment, Noise pollution control.

3. Waste Management (3L)

Solid waste management, Open dumping, Land filling, incineration, composting, E-waste management, Biomedical Waste management.

Module 4 – Disaster Management (3L)**1. Study of some important disasters (2L)**

Natural and Man-made disasters, earthquakes, floods drought, landside, cyclones, volcanic eruptions, tsunami, Global climate change. Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

2. Disaster management Techniques (1L)

Basic principles of disasters management, Disaster Management cycle, Disaster

management policy, Awareness generation program

Text Books:

1. Basic Environmental Engineering and Elementary Biology (For MAKAUT), Gourkrishna Dasmohapatra, Vikas Publishing.
2. Basic Environmental Engineering and Elementary Biology, Dr. Monindra Nath Patra & Rahul Kumar Singha, Aryan Publishing House.
3. Textbook of Environmental Studies for Undergraduate Courses, Erach Barucha for UGC, Universities Press

Reference Books:

1. A Text Book of Environmental Studies, Dr. D.K. Asthana & Dr. Meera Asthana, S. Chand Publications.
2. Environmental Science (As per NEP 2020), Subrat Roy, Khanna Publisher.

CO – PO Mapping

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Able to understand the natural environment and its relationships with human activities	2	2	3	-	-	2	3	3	-	-	1	2
2	The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk	3	3	3	1	1	2	3	3	-	-	1	2
3	Ability to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues	3	3	3	2	1	2	3	3	-	-	1	2
4	Acquire skills for scientific problem-solving related to air, water, noise & land pollution.	1	1	1	1	2	2	3	3	-	-	1	2
AVERAGE		2	2	2	1	1	2	3	3	-	-	1	2

COURSE NAME: INDIAN KNOWLEDGE SYSTEM

CODE: HU(CE)102

CONTACT:1:0:0

TOTAL CONTACT HOURS: 12

CREDITS:1

Pre-requisites:10+2

Course Objective(s)

To holistic development of physical, mental and spiritual wellbeing of one and all, at the level of individual, society, nation and ultimately the whole world.

Course Outcomes (COs):

CO1: To recall & state thought process of social setting in ancient India to identify the roots and details of some contemporary issues faced by Indians

CO 2: The students are able to identify & inspect the importance of our surroundings& culture to design & formulate sustainable developmental solutions

CO 3: To develop the ability to understanding the issues related to ‘Indian’ culture, tradition and its composite character to apply the same in the socio-technological developments in present scenario

CO 4: The students are able to relate & assess Indian Knowledge System in the health care, architecture, agriculture & other systems .

Course Content -

Module-1

3L

An overview of Indian Knowledge System (IKS): Importance of Ancient Knowledge - Definition of IKS - Classification framework of IKS - Unique aspects of IKS.

The Vedic corpus: Vedas and Vedangas - Distinctive features of Vedic life.

Indian philosophical systems: Different schools of philosophy.

Module-23L

Salient features of the Indian numeral system - Importance of decimal representation - The discovery of zero and its importance - Unique approaches to represent numbers.

Highlights of Indian Astronomy: Historical development of astronomy in India

Module-33L

Indian science and technology heritage - Metals and metalworking - Mining and ore extraction –Physical structures in India - Irrigation and water management - Dyes and painting technology - Surgical Techniques - Shipbuilding

Module-43L

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, Traditional Knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs.

References:

- 1) Introduction to Indian knowledge system: concepts and applications- Mahadevan B.Bhat, Vinayak Rajat, Nagendra Pavana R.N., PHI
- 2) Traditional Knowledge system in India, Amit Jha, Atlantic Publishers
- 3) S. N. Sen and K. S. Shukla, *History of Astronomy in India*, Indian National Science Academy, 2nd edition, New Delhi, 2000

CO and PO mapping:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	-	-	2	3	-	3	-	2	3	1	-	2
CO2	-	-	2	-	-	3	3	2	3	3	-	
CO3	-	-	2	-	-	3	3	1	3	1	-	2
CO4			2			3	3	2	3			

COURSE NAME: ENGINEERING GRAPHICS & DESIGN LAB

COURSE CODE: CE191

CONTACT: 0:0:3

CREDITS: 1.5

Prerequisites: Basic knowledge of geometry

Course Objectives:

To acquaint students with the knowledge of various lines, geometrical constructions and construction of various kinds of scales, Ellipse, etc.

Course Outcomes: Upon successful completion of this course, the student will be able to:

CO1: Learn the basics of drafting

CO2:

Understand the use of drafting tools which develop the fundamental skills of industrial drawing.

CO3:

Apply the concept of engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.

CO4:

Analyse the concept of projection of line, surface and solid to create the knowledge base for orthographic and isometric view of structures and machine parts.

CO5:

Evaluate the design model to different sections of industries as well as for research & development.

Course Contents:

Basic Engineering Graphics:

3P

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Module 1: Introduction to Engineering Drawing

6P

Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloid and Involute; Scales—Plain, Diagonal and Vernier Scales.

Module 2: Orthographic & Isometric Projections

6P

Principles of Orthographic Projections—Conventions - Projections of Points and lines inclined to both planes; Projections of planes on inclined Planes - Auxiliary Planes; Projection of Solids inclined to both the Planes - Auxiliary Views; Isometric Scale, Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.

Module 3: Sections and Sectional Views of Right Angular Solids

6P

Drawing sectional views of solids for Prism, Cylinder, Pyramid, Cone and project the true shape of the sectioned surface, Auxiliary Views; Development of surfaces of Right Regular Solids -

[illegible]

COURSE NAME: ENGINEERING PHYSICS LAB

COURSECODE: PH(CE)191

CONTACT:0:0:3

TOTAL CONTACT HOURS: 3 PER WEEK

CREDITS:1.5

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objectives:

The aim of course is to provide adequate exposure and develop insight about the basic principles of physical sciences and its practical aspects which would help engineers to learn underlying principles of various tools and techniques they use in core engineering and related industrial applications. The course would also inculcate innovative mindsets of the students and can create awareness of the vital role played by science and engineering in the development of new technologies.

Course Outcomes (COs):

After attending the course students' will be able to

CO1 : demonstrate experiments allied to their theoretical concepts

CO2 : conduct experiments using LASER, Optical fiber.

CO3 : participate as an individual, and as a member or leader in groups in laboratory sessions actively

CO4 : analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiment.

CO5: Design solutions for real life challenges.

Course Content:

General idea about Measurements and Errors (One Mandatory):

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.

Experiments on Classical Physics (Any 4 to be performed from the following experiments):

1. Study of Torsional oscillation of Torsional pendulum & determination of time using various load of the oscillator.
2. Determination of Young's moduli of different materials.
3. Determination of Rigidity moduli of different materials.
4. Determination of wavelength of light by Newton's ring method.
5. Determination of wavelength of light by Laser diffraction method.
6. Optical Fibre-numerical aperture, power loss.

Experiments on Quantum Physics (Any 2 to be performed from the following experiments):

7. Determination of Planck's constant using photoelectric cell.
8. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
9. Determination of Stefan's Constant.
10. Study of characteristics of solar cell.

Perform atleast one of the following experiments :

11. Determination of dielectric constant of given sample (frequency dependent)
12. Determination of velocity of ultrasonic wave using piezoelectric crystal.

****In addition it is recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.**

Probable experiments beyond the syllabus:

1. Study of dispersive power of material of a prism.
2. Study of viscosity using Poiseuille's capillary flow method/using Stoke's law.
3. Determination of thermal conductivity of a bad/good conductor using Lees-Charlton / Searle apparatus.
4. Determination of the angle of optical rotation of a polar solution using polarimeter.
5. Any other experiment related to the theory.

Recommended Text Books for Engineering Physics Lab:

Waves & Oscillations:

1. Vibration, Waves and Acoustics- Chattopadhyay and Rakshit Classical & Modern

Optics:

2. A text book of Light- K.G. Mazumder & B.Ghosh (Book & Allied Publisher)

Quantum Mechanics-I

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)

Solid State Physics:

1. Solid State Physics and Electronics-A. B. Gupta and Nurul Islam (Book & Allied Publisher)

Text Books:

1. Practical Physics by Chatterjee & Rakshit (Book & Allied Publisher)
2. Practical Physics by K.G. Mazumder (New Central Publishing)
3. Practical Physics by R. K. Kar (Book & Allied Publisher)

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	--	--	--	--	--	--	--
CO2	2	3	2	3	3	--	--	--	--	--	--	--
CO3	2	3	2	3	3	--	--	--	--	--	--	--
CO4	2	2	3	2	3	--	--	--	--	--	--	--
CO5	2	2	3	2	3	--	--	--	--	--	--	--

PAPER NAME: BASICELECTRICAL ENGINEERING LAB

PAPER CODE:EE(CE)191

CONTACT HOUR:3 PER WEEK

CREDIT:1.5

Prerequisites:Design and solve the fundamental electrical and electronics circuits

CourseObjectives:

To identify appropriate method of solving the fundamental electrical and electronics circuits. To Design and conduct experiments on electrical and electronics circuits

COURSE OUTCOMES:

CO	Statement
CO1	To Analyze a given network by applying KVL and KCL.
CO2	To Examine the Operation of DC Motor.
CO3	To Examine the Operation of Basic Electronics Devices and ICs.
CO4	To design simple electronics circuits.

List of Experiments: -

- 1.Familiarization with different passive and active electrical & electronic components.
- 2.Familiarization with different Electrical & Electronics Instruments.
- 3.Verification of KVL and KCL.
- 4.Forward and reversal of DC shunt motor.
- 5.Speed control of DC shunt motor.
- 6.Study of the P-N junction diode V-I characteristics (Forward & Reverse Bias).
- 7.Study of the Characteristics of Zener diode (Forward & Reverse Bias).
- 8.Study of the Input and Output characteristics of BJT in CE mode.
- 9.Determination of offset voltage, offset current & bias current of OPAMP(IC741).
10. Determination of CMRR and slew rate of OPAMP(IC741).
11. Determination of inverting and non-inverting gain of OPAMP(IC741).
12. Extramural Experiment.

Textbooks:

1. Handbook of Laboratory Experiments in Electronics Engineering Vol. 1, Author Name: A.M. Zungeru, J.M. Chuma, H.U. Ezea, and M. Mangwala, Publisher -Notion Press Electronic Devices and Circuit Theory by Robert Boylestad Louis Nashelsky, 7th Edition, Prentice Hall
2. Experiments Manual for use with Grob's Basic Electronics 12th Edition by Wes Ponick, Publisher-McGraw Hill, 2015
3. Laboratory Manual for 'Fundamentals of Electrical & Electronics Engineering': A handbook for Electrical & Electronics Engineering Students by Manoj Patil (Author), Jyoti Kharade (Author), 2020
4. The Art of Electronics, Paul Horowitz, Winfield Hill, Cambridge University Press, 2015.
5. A Handbook of Circuit Math for Technical Engineers, Robert L. Libbey CRC Press, 05-Jun-1991

Reference Books

1. Basic Electrical and Electronics Engineering, Author: S. K. Bhattacharya, Publisher: Pearson Education India, 2011
2. Practical Electrical Engineering
3. By Sergey N. Makarov, Reinhold Ludwig, Stephen J. Bitar, Publisher: Springer International Publishing, 2016
4. Electronics Lab Manual (Volume 2) By Navas, K. A. Publisher: PHI Learning Pvt. Ltd. 2018
5. Practical Electronics Handbook, Ian R. Sinclair and John Dunton, Sixth edition 2007, Published by Elsevier Ltd.

CO-PO Course Articulation Matrix Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	2	3	2	-	2	-	-	2	-	2	3
CO2	3	3	2	3	-	2	-	-	3	-	2	2
CO3	3	2	2	3	-	2	-	-	2	-	3	3
CO4	3	3	2	2	-	2	-	-	3	-	2	3

COURSE NAME: TECHNICAL REPORT WRITING AND LANGUAGE LAB**COURSE CODE: HU(CE)191****CONTACT: 0:0:3****TOTAL CONTACT HOURS: 3 PER WEEK****CREDITS: 1.5**

Prerequisites: A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons and Communication Competence

Course Objective: To maximize exposure and train students in the professional use of English in the globalized workplace.

Course Outcome:

CO	Statement
CO1	Able to develop advanced verbal and nonverbal communication skills through PowerPoint presentation.
CO2	Able to demonstrate interpersonal skills through Group Discussion both for organizational communication and campus recruitment drive.
CO3	Able to recognize and apply the knowledge of public speaking.
CO4	Able to be industry-ready professionals by various personality development programs.
CO5	Understand and write a detailed technical report as per organizational needs

Course contents:**Module 1: Presentation [2L+6P]**

- (a) Teaching Presentation as a Skill
- (b) Speaking Strategies and Skills
- (c) Media and Means of Presentation
- (d) Extended Practice and Feedback

Module 2: Effective Presentation [2L+6P]

- a) Rules of making micro presentation.
- b) Assignment on micro presentation.
- c) Need for expertise in oral presentation.
- d) Assignment on Oral presentation.
- e) Macro Presentation in Groups.

Module 3: Writing a Technical Report [2L+6P]

- (a) Organizational Needs for Reports and types
- (b) Report Formats
- (c) Report Writing Practice Sessions and Workshops

Module 4: Speaking Skills [2L+6P]

- (a) The Need for Speaking: Content and Situation-based speaking
- (b) Public Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]
- (c) The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Text / Reference Books: Technical communication By Meeenakshi Raman
and SangeetaSharma;Oxford Publication.

CO-POmapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	3	2	-	-	3	3	1	3
CO2	3	3	-	-	-	3	-	-	3	3	-	3
CO3	2	2	2	-	-	2	1	-	3	3	1	3
CO4	2	-	-	-	1	3	-	-	3	3	1	3
CO5	1	2	-	-	2	2	-	2	3	3	1	3

COURSE NAME: COMPETENCIES IN SOCIAL SKILLS

COURSECODE: HU(CE)192

CONTACT:0:0:2

TOTAL CONTACT HOURS:2 PER WEEK

CREDITS:1

Pre requisites: Basic knowledge of LSRW skills.

Course Objective: This is an activity-based, goal-oriented, functional course in English Communication, which aims to make the students able and efficient communicators by helping them to be self-reflexive about English.

Course Outcomes:

CO1: Aims to equip the students with the relevant skills of presentation and expression needed in the academic as well as in the professional domains

CO2: Able to apply listening, speaking, reading and writing skills in societal and professional life.

CO3: Able to demonstrate the skills necessary to be a competent Interpersonal communicator.

CO4: Able to analyse communication behaviours.

CO5: Able to promote the acquisition of analytical and comprehension skills, writing skills exercises and interpersonal skills.

Course Content:

Module 1: Introduction to the Language Lab

- a. The Need for a Language Laboratory
- b. Tasks in the Lab
- c. Writing a Laboratory Note Book

Module 2: Active Listening

- a. What is Active Listening?
- b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking
- c. Academic Listening vs Business Listening
- d. Listening in Business Telephony
- e. Study of Contextualized Examples based on Lab Recordings

Module 3: Speaking

- a. Speaking—Accuracy and Fluency Parameters
- b. Pronunciation Guide—Basics of Sound Scripting, Stress and Intonation
- c. Fluency-focussed activities—JAM, Conversational Role Plays, Speaking using Picture/Audio Visual inputs
- d. Accuracy-focussed activities—Identifying Minimal Pairs, Sound Mazes, Open and Closed Pair Drilling, Student Recordings (using software)
- e. Identifying the tone (admiring, accusatory, ironical, sympathetic, evasive, indecisive, ambiguous, neutral etc.) of the writer and view-points.

Module 4:

- a. Industrialization and society
- b. Industrial psychology and industrial democracy.
- c. Environment in industry.
- d. Fatigue of workers.

e. Motivation, selection and training of workers.

Reference Books:

1. IT Mumbai, Preparatory Course in English syllabus
2. A New Look into Social Sciences, Sheikh Sabir, A.M. Shiekh and Jaya Dwadshiwar, Sage Publication New Delhi.
3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

CO-POmapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	3	2	1	2	3	3	3	3
CO2	3	-	2	-	3	-	-	-	3	3	3	3
CO3	1	2	-	-	2	-	-	2	3	3	3	3
CO4	1	-	-	-	-	3	3	3	3	3	-	3
CO5	-	3	-	2	2	-	-	-	3	3	3	3

1 st Year2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE201	Engineering Mechanics	3	0	0	3	3
2	SCI	Multidisciplinary	CH(CE)201	Engineering Chemistry	2	0	0	2	2
3	SCI	Multidisciplinary	M(CE)201	Engineering Mathematics –II	3	0	0	3	3
4	HUM	Ability Enhancement Course	HU201	Professional Communication	2	0	0	2	2
5	HUM	Value Added Course	HU202	Values and Ethics	2	0	0	2	2
6	HUM	Value Added Course	HU203	Constitution of India	1	0	0	1	1
B.PRACTICAL									
1	ENGG	Major	CE291	Auto cad Lab	0	0	3	3	1.5
2	HUM	Ability Enhancement Course	HU291	Professional Communication Lab	0	0	2	2	1
3	SCI	Skill enhancement Course	CH(CE)291	Engineering Chemistry Lab	0	0	2	2	1.0
4	ENGG	Skill enhancement Course	ME(CE)291	Workshop & Manufacturing Practices Lab	0	0	3	3	1.5
Totalof Theory andPracticalCourses								24	18

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines

COURSE NAME: ENGINEERING MECHANICS**COURSE CODE: CE201****CONTACTS: 3:0:0****TOTAL CONTACT HOURS: 36****CREDITS: 3****Prerequisites:** Basic Concept of Physics, Engineering Mechanics.**Course Objectives:** To understand the concept of basic engineering mechanism.**Course Outcomes:**

CO1	Students will understand the concepts of engineering mechanics
CO2	Students will understand the vectorial representation of forces and moments
CO3	Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.
CO4	Students will gain knowledge regarding various types of forces and reactions and to draw free body diagram to quicker solutions for complicated problems.
CO5	Student will gain knowledge in solving problems involving work and energy
CO6	Student will gain knowledge on friction on equilibrium and its application.

Course Contents:

Module No.	Syllabus	Contact Hrs.
Module 1:	Introduction to Engineering Mechanics: Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Vector Mechanics-dot product, cross product, Problems.	8
Module 2:	Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack, Problems.	4
Module 3:	Basic Structural Analysis: Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines, Problems.	4
Module 4:	Centroid and Centre of Gravity: Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadrilateral, etc., Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications, Problems.	4

Module 5:	Moment of Inertia: A moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections ; Mass moment of inertia of circular plate, Cylinder, Cone, Sphere, Hook, Problems.	4
Module 6:	Virtual Work and Energy Method: Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Application of energy method for equilibrium. Stability of equilibrium, Problems.	3
Module 7:	Review of particle dynamics: rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton 's 2 nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique), Problems	5
Module 8:	Introduction to Kinetics of Rigid Bodies: Basic terms, general principles in dynamics; Types of motion, Instantaneous center of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work-energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation, Problems.	4

Textbooks:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I-Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibbeler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shames and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education

Referencebooks:

1. ReddyVijaykumarK.andK.SureshKumar(2010),Singer’sEngineeringMechanics
2. BansalR.K.(2010),AText BookofEngineering Mechanics,LaxmiPublications
3. KhurmiR.S. (2010),EngineeringMechanics, S. Chand&Co.
4. TayalA.K.(2010),EngineeringMechanics,UmeshPublications

CO – PO/PSOMapping:

[illegible]

Course Name: ENGINEERING CHEMISTRY

Paper Code: CH (CE)201

CONTACT: 2-0-0

Total Contact Hours: 24

Credit: 2

Prerequisites:10+2

Course Objectives:

- To understand the basic principles of elements, organic reactions, drug synthesis and technological aspects of modern chemistry
- To apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems
- To analyse and evaluate quality parameters of water and its treatment
- Apply the knowledge of free energy, energy storage device, semiconductors, fuels and corrosion to design environment friendly & sustainable devices
- Apply the knowledge of different instrumental techniques to analyse unknown engineering materials.

Course Outcomes:

CO1. Able to understand the basic principles of elements, organic reactions drug synthesis and computational chemistry

CO2. Able to apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems

CO3. Able to analyse and evaluate water quality parameters and its treatment

CO4. Able to the knowledge of free energy, energy storage device, fuels and corrosion to design environment friendly & sustainable devices

CO5. Able to apply the knowledge of different instrumental techniques to analyse unknown engineering materials

Course Contents:

Module 1 - Elements and their properties (6L)

1. Elements and their properties (3L)

Bohr's theory for one electron system, Hydrogen spectrum, Quantum numbers, Atomic orbitals, Pauli's exclusion principle, Hund's rule, exchange energy, Aufbau principle, Electronic configuration and Magnetic properties.

2. Periodic Table for Engineers (3L)

Modern Periodic table, Periodic properties, study of advanced functional materials like Silicones, Silicates, Zeolite and alloys like steel, mischmetall, Neodymium alloy and their applications

Module 2 - Energy devices and Semiconductors (6L)

1.Use of free energy in chemical equilibria (3L)

Laws of Thermodynamics, Enthalpy, Entropy, Spontaneity, Electrochemical Cell, Dry Cell, Mercury Cell, Lead Storage batteries, Fuel Cells, Solar Cells, Nernst equation and applications, Electrochemical sensors

2.Crystals and Semiconductors (3L)

Crystals and their defects, Stoichiometric and Non-stoichiometric defects, Band theory and Doping, n-type

and p-type semiconductors, Superconductors

Module 3 –Industrial Applications of Chemistry (8L)

1.Advanced Polymeric materials (3L)

Classification, Engineering Plastics, conducting polymers, bio polymers, polymer composites

2.Industrial corrosion (2L)

Classification, Effects of corrosion, Preventive measures

3.Analysis of Water Quality (1L)

Water quality parameters

4. Fuels and their applications (2L)

Classification of Fuels, Calorific Values, Solid fuels; coal qualifications, Liquid Fuels; Knocking, Cetane and Octane number, composition and uses of gaseous fuels; water gas, Bio Gas, CNG, LPG.

Module 4 – Organic Reaction Products and their spectroscopic analysis (4L)

1.Organic Reactions (2L)

Substitution, Elimination and Addition reactions

2.Drug designing and synthesis (1L)

Paracetamol, Aspirin

3. Spectroscopic Analysis (1L)

UV – Visible Spectra, IR spectra

Suggested Text Books

- (i) Fundamentals of Engineering Chemistry, By Dr. Sudip Bandopadhyay & Dr. Nirmal Kumar Hazra
- (ii) A Text Book of Engineering Chemistry by Dr. Rajshree Khare
- (iii) Engineering Chemistry 1, Gourkrishna Dasmohapatra

Reference Books

- (i) Engineering Chemistry, 16th Edition, P.C. Jain & Dr. Monica Jain
- (ii) A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co.
- (iii) Fundamentals of Molecular Spectroscopy, by C. N.Banwell
- (iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan

CO v/s PO MAPPING

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

COURSE NAME: ENGINEERING MATHEMATICS -II

COURSE CODE: M (CE) 201

CONTACT: 3-0-0

TOTAL CONTACT HOURS: 36

CREDIT: 3

Prerequisite: The students to whom this course will be offered must have the concept of (10+2) algebra and calculus.

Course Objectives:

The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course. To understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes (COs):

On successful completion of the learning sessions of the course, the learner will be able to

CO1: Recall the properties and formula related to Fourier series, Fourier Transformations and Numerical Methods.

CO2: Determine the solutions of the problems related to matrix algebra, probability and Numerical Methods.

CO3: Apply the appropriate mathematical tools of matrix algebra, probability and Numerical Methods.

CO4: Analyze different engineering problems linked with matrix algebra, probability and Numerical Methods.

Course Content:

Module I: Numerical Methods (12L)

Introduction to error analysis, Calculus of finite difference. **Interpolation:** Newton forward and backward interpolation, Lagrange's interpolation, **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule. **Numerical solution of ordinary differential equation:** Euler method, Modified Euler method, Fourth order Runge-Kutta method.

MODULE II: Fourier series and Fourier Transform: (13 Lectures)

Fourier series: Dirichlet's Conditions; Euler's Formula for Fourier Series; Fourier Series for functions of period 2π ; Sum of Fourier series (examples); Theorem for the convergence of Fourier series (statement only); Fourier series of a function with its periodic extension; Half range Fourier series: Construction of half range Sine series and half range Cosine Series; Parseval's identity (statement only) and related problems.

Fourier Transform: Fourier Transform, Fourier Cosine Transforms, Fourier Sine Transforms (problems only); Properties of Fourier Transform: Linearity, Shifting, Change of Scale, Modulation (problems only); Fourier Transform of Derivatives (problems only); Convolution Theorem (statement only), Inverse of Fourier Transform (problems only).

MODULE III: Calculus of Complex Variable: (13 Lectures)

Functions of a Complex Variable Analytic Functions (definition and examples); Cauchy-Riemann Equations (statement only & related problems); Sufficient condition for a function to be analytic (statement only & related problems).

Cauchy's Theorem (statement only & related problems); Cauchy's Integral Formula (statement only & related problems); Cauchy's Integral Formula for the derivative of an analytic function (statement only & related problems); Cauchy's Integral Formula for the successive derivatives of an analytic function (statement only & related problems); Taylor's series and Laurent's series (problems only).

Zero of an Analytic Function and its order (definition & related problems); Singularities of an Analytic Function: Isolated Singularity and Non-isolated Singularity (definition & related problems); Essential Singularities, Poles (Simple Pole and Pole of Order m) and Removable Singularities (definition & related problems); Determination of singularities and their nature (problems only); Residue (definition & examples); Determination of the residue of a given function; Cauchy's Residue theorem (statement only & related problems).

Text Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
5. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint,
6. Samanta Guruprasad, A text book of Engineering Mathematics-III, New age International Publishers
7. Mollah, S. A, Numerical Analysis and Computational Procedures, Books and Allied (P) Ltd.

Reference Books:

1. Dey, Sukhendu, Gupta Sisir, Numerical Methods, McGraw Hill Education (India) Private Limited.
2. Jain, M. K., Iyengar, S. R. K., Jain, R. K., Numerical Methods, New age International Publishers

CO-PO Mapping:

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	2	3	2	2	-	-	-	-	-	-	-	2

COURSE NAME: PROFESSIONAL COMMUNICATION**COURSE CODE: HU(CE)201****CONTACT: 2:0:0****TOTAL CONTACT HOURS: 24****CREDITS: 2**

Pre-requisites:	Basic(10+2)levelof knowledgeofEnglishgrammar,vocabularyreading andwriting skills.
CourseObjectives	The course aims to impart domain and industry-specificcommunicationskillsinaglobalizedcontextandto promote the understandingofbusiness communicationpracticesandcross cultural dynamics.
CourseOutcomes:	By pursuing this course the students shall be able to
	CO1. Define, describe and classify the modalities and nuances of communication in a workplace context.
	CO2. Review, appraise and understand the modes, contexts and appropriacy of communicating across cultures and societies.
	CO3. Identify, interpret and demonstrate the basic formats, templates of business and official communication.
	CO4. Identify, compare and illustrate reading strategies and basic writing strategies.
	CO5. Interpret, analyze and evaluate semantic-structural, interpersonal and multicultural dynamics in business communication.

Course Content:**Module1:****Verbal and Nonverbal communication****4 L**

Definition, Relevance and Effective Usage

Components of Verbal Communication: Written and Oral Communication

Components of Non-

verbal Communication: Kinesics, Proxemics, Chronemics, Haptics Paralanguage

Barriers to Effective Communication

Module2:**Workplace Communication Essentials and Cross Cultural Communication 4L**

Communication at the Workplace—Formal and Informal Situations
 Language in Use—Jargon, Speech Acts/Language Functions, Syntactical and Grammatical Appropriacy
 Cultural Contexts in Global Business: High Context and Low Context Cultures
 Understanding Cultural Nuances and Stereotyping
 Achieving Culturally Neutral Communication in Speech and Writing

Module3:**4L****Reading Strategies and Basic Writing Skills**

Reading: Purposes and Nature of Reading
 Reading Sub-Skills—Skimming, Scanning, Intensive Reading
 Reading General and Business Texts (Reading for Comprehension and Detailed Understanding)
 Basic Writing Skills—Paragraph and Essay writing, writing technical documents
 Writing Technicalities—Paragraphing, Sentence Structure and Punctuation

Module4:**4L****Report Writing**

Nature and Function of Reports
 Types of Reports
 Researching for a Business Report
 Format, Language and Style
 Report Documentation

Module5:**Employment Communication**

- a. Writing Business Letters (Enquiry, Order, Sales, Complaint, Adjustment, Job Application, Offer) **2L**
- b. Creating an Employee Profile-- Preparing a CV or Résumé.
 Creating a Digital/Online Profile—LinkedIn (Résumé/Video Profile) **2L**
- c. Writing Other Interoffice Correspondence--E-mails: types, convention, and etiquette,
 Memo, Notices and Circulars **2L**
- d. Preparing Meeting Documentation—Drafting Notice and Agenda of Meetings, Preparing Minutes of Meetings. **2L**

References:-

1. Meenakshi Raman and Sangeetha Sharma. *Technical Communication*. 3rd edition. New Delhi: Oxford University Press, 2015.
2. Mark Ibbotson. *Cambridge English for Engineering*. Cambridge: Cambridge University Press, 2008.
3. Mark Ibbotson. *Professional English in Use: Engineering*. Cambridge: Cambridge UP, 2009.
4. Lesikar et al. *Business Communication: Connecting in a Digital World*. New Delhi: Tata McGraw-Hill, 2014.

5. John Seeley. *Writing Reports*. Oxford: Oxford University Press, 2002.
6. Judith Leigh. *CVs and Job Applications*. Oxford: Oxford University Press, 2002.
7. Judith Leigh. *Organizing and Participating in Meetings*. Oxford: Oxford University Press, 2002.
8. Michael Swan. *Practical English Usage*. Oxford: OUP, 1980.
9. Pickett, Laster and Staples. *Technical English: Writing, Reading & Speaking*. 8th ed. London: Longman, 2001.
10. Diana Booher. *E-writing: 21st Century Tools for Effective Communication*.

Links:-

1. Purdue University's Online Writing Lab (OWL) - <https://owl.purdue.edu/>
2. Business English Pod - <https://www.businessenglishpod.com/>

CO-PO Mapping

Course Name: Professional Communication

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO.1	-	-	-	-	-	2	1	1	2	3	-	2
CO.2	-	-	-	-	-	1	1	2	2	3	-	3
CO.3	-	-	-	-	-	3	3	1	1	3	2	3
CO.4	-	-	-	-	-	3	3	1	-	3	-	3
CO.5						2	2	2	2	3	-	3

Course Name: Values and Ethics
Course Code: HU(CE)202
Contacts: 2:0:0
Total Contact Hours: 24
Credit: 2

Prerequisite: 10+2

Course Objectives:

Understood human values, their significance and role in life. Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others. Practice respect for human rights and democratic principles.

Course Outcomes:

CO 1	Understand the significance of values, various approaches to ethics and its applications in life and profession.
CO2	Able to distinguish Self and the Body, to understand Harmony in the Self
CO3	To identify and eradicate environmental concerns through technology
CO4	Demonstrate work ethics and analyse business strategies
CO5	Ability to understand gender terminologies and to identify gender issues

Course Content:

Module: 1 Introduction:(4L)

Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, and Social

Types of values-Social, Psychological, Aesthetic, Spiritual, and Organizational

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

Module 2: Universal Human Harmony. (4L)

Basic Human Aspirations, Happiness and Prosperity, Self-Exploration, Self and the Body

Understanding the harmony in the Nature.

Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.

Values Crisis in contemporary society Nature of values: Value Spectrum of a good life (Maslow's Pyramid)

Module: 3 Ethical Concerns: (6L)

Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Rapid Technological growth and depletion of resources, Reports of the Club of Rome.

Problems of Technology transfer- Technology assessment impact analysis -Human Centered Technology.

Module: 4 Ethics of Profession: (4L)

Work Ethics and Work Values, Business Ethics, Human values in organizations:

Social and ethical responsibilities of Technologists. Codes of professional ethics.

Types of Ethical issues- Internal Ethics of Business –

Whistle Blowing

Impact of Ethics on Business Policies and Strategies – Ethical Leadership – Characteristics

Module: 5 Self Development AND Gender Awareness (6L)

Definition of Gender, Basic Gender Concepts and Terminology, Exploring Attitudes towards Gender,

Social Construction of Gender

Gender Roles and Relations, Types of Gender Roles, Gender Roles and Relationships Matrix, Gender-based Division and Valuation of Labour. Gender Development Issues, Identifying Gender Issues

Text Books:

1. Beneria, Lourdes. (2004). Gender, Development, and Globalization: Economics as if All People Mattered. Routledge Press. (GDGE)
2. Molyneux and Razavi. (2002). Gender Justice, Development and Rights. Oxford University Press (GJDR or WGD)
3. Visvanathan, Duggan, Wieggersma and Nisonoff. (2011).
4. The Women, Gender and Development Reader. 2nd Edition. Zed Press (WGD)
5. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
6. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
7. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	3	3	-	2
CO2	-	-	-	-	-	3	3	-	3	2	-	-
CO3	-	3	3	-	3	2	3	-	-	-	-	2
CO4	2	-	-	2	-	-	-	3	-	-	2	-
CO5	-	3	-	-	-	2	1	-	-	2	-	2

Paper Name: Constitution of India

Paper Code: HU(CE)203

Credit: 01

No. of lectures: 12

Prerequisite: 10+2

Course Objectives: To know the importance of Constitution and Government

Course Outcomes: On Completion of this course student will be able to

CO1: To Identify and explore the basic features and modalities of Indian constitution.

CO2: To Differentiate and relate the functioning of Indian parliamentary system at the centre and state level.

CO3: To Differentiate the various aspects of Indian Legal System and its related bodies.

Course Content:

Module 1: History of Making of the Indian Constitution: History. Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features **3L**

Module 2: Fundamental Rights, Fundamental Duties, Directive Principles of State Policy: **6L**

The Right to Equality

The Right to Freedom: I (Article 19)

The Right to Freedom: II (Articles 20, 21 and 22)

The Right against Exploitation

The Right to freedom of Religion

Cultural and Educational rights

The Right to Property

The Right to Constitutional Remedies

Fundamental Duties

Module-3:Organs of Governance: **3L**

Parliament - Composition - Qualifications and Disqualifications -Powers and Functions – Executive- President -Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

Text / Reference Books:

- 1) Indian Constitution by D.D.Basu, The Publisher, LexisNexis
- 2) Constitution of India by Subhas C Kasyap, Vitasta Publishing
- 3) The Constitution of India, P.M Bakshi, Universal Law Publishing Co.Ltd, New Delhi, 2003.
- 4) Indian Constitution Text Book - Avasthi, Avasthi,Publisher: LAKSHMI NARAIN AGARWAL
- 5) Introduction to the Constitution of India, Brij Kishore Sharma, PHI

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	3	-	-	-	-	-	-	-	-
CO2	-	-	-	3	-	2	3	-	-	-	-	-
CO3	-	2	2	3	3	2	2	-	-	-	-	-

Course Name: ENGINEERING CHEMISTRY LAB

Paper Code: CH (CE)291

Contact: 0-0-2

Total Contact Hours: 24

Credit: 1

Prerequisites:10+2

Course objectives:

- Study the basic principles of pH meter and conductivity meter for different applications
- Analysis of water for its various parameters & its significance in industries
- Learn to synthesis Polymeric materials and drugs
- Study the various reactions in homogeneous and heterogeneous medium

Course Outcome

CO1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.

CO2: Able to analyse and determine the composition and physical property of liquid and solid samples when working as an individual and also as a team member

CO3: Able to analyse different parameters of water considering environmental issues

CO4: Able to synthesize drug and sustainable polymer materials.

CO5: Capable to design innovative experiments applying the fundamentals of modern chemistry

Course Contents:

1. Determination of the concentration of the electrolyte through conductance measurement.
2. Determination of water quality measurement techniques.
3. Determination of the concentration of the electrolyte through pH measurement.
4. Estimation of Cu in brass
5. Estimation of Fe₂O₃ in Cement
6. Isolation of graphene from dead dry batteries and their use for temporary soldering.
7. Synthesis of Silver Nanoparticles doped organic thin film for organic transistors.
8. Estimation of corrosion in a given sample metal.
9. Preparation of Si-nano crystals for future memory devices.
10. Green Synthesis of ZnO based Polymer Nano composites.
11. Synthesis of polymers for electrical devices and PCBs.
12. Determination of Partition Coefficient of acetic acid between two immiscible liquids.
13. Drug design and synthesis
14. Rheological properties of the Newtonian fluids
15. Innovative Experiments

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	2	-	-	1	1	-	2	3	-	2
C02	-	-	2	2	-	3	3	-	2	3	-	3
C03	-	-	2	2	-	3	3	2	2	3	-	3
C04	-	-	-	-	-	3	3	2	2	3	-	3
C05	-	-	2	2	-	3	3	2	2	3	-	3

COURSE NAME: Workshop and Manufacturing Practices Lab

COURSE CODE: ME(CE)291

CONTACT: 0:0:3

CREDITS: 1.5

Prerequisite: Physics & Mathematics (10+2 Level)

Course Objectives:

To impart knowledge and skill to use tools, machines, equipment, and measuring instruments

Course outcomes:

CO1: Gain basic knowledge of Workshop Practice and Safety useful for our daily living.

CO2: Understand the use of Instruments of a pattern shop like Hand Saw, Jack Plane, Chisel etc.

CO3: Apply and perform operations like such as Marking, Cutting etc used in manufacturing processes.

CO4:

Analyse the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.

CO5:

Get hands on practice of Welding and apply various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

Course Content:

3P

(i) Theoretical discussions:

1. Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Carpentry
4. Welding (arc welding & gas welding), brazing
5. Electrical & Electronics
6. Metal casting
7. CNC machining, Additive manufacturing, 3D Printing
8. Plastic moulding & Glass Cutting

(ii) Workshop Practice:

At least 6 modules should be covered

Module 1-Machinshop

6P

Typical job that may be made in this practice module:

- i. To make a pin from a mild steel rod in a lathe.
- ii. To make a rectangular and vee slot in a block of cast iron or mild steel in a shaping and/or milling machine.

Module 2-Fitting shop

6P

Typical job that may be made in this practice module: To make a Gauge from MS plate.

Module 3 –Carpentry Shop

6P

Typical job that may be made in this practice module: To make wooden joints and/or a pattern or like.

Module 4-Welding & Soldering shop

6P

Typical job that may be made in this practice module:

- i. Arc Welding: To joint two thick (approx 5mm) MS plates by manual metal arc welding.
- ii. Gas Welding: To joint two thin mild steel plates or sheets by gas welding.
- iii. House wiring, soft soldering

Module 5–Smithy & Casting

6P

Typical job that may be made in this practice module:

- i. A simple job of making a square rod from a round bar or similar.
- ii. One/two greensand moulds to prepare, and a casting be demonstrated.

Module 6– CNC Machining & Laser Cutting

6P

Typical job that may be made in this practice module:

- i. At least one sample shape on mild steel plate should be made using CNC Milling / CNC Lathe Machine
- ii. At least one sample shape on glass should be made using laser cutting machine.

Module 7 – 3D Printing

6P

- i) Exposure to a 3D printing machine,
- ii) 3D printing of at least one sample model using available materials.

Examinations could involve the actual fabrication of simple components, covered above.

utilizing one or more of the techniques

Text Books:

1. Hajra Choudhury S.K.,
Hajra Choudhury A.K. and Nirjhar Roy S.K., –Elements of Workshop Technology II, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., –Manufacturing Technology II, Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Reference Books:

1. Gowri P., Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2. Roy A. Lindberg, –Processes and Materials of Manufacture II, 4th edition, Prentice Hall India, 1998.
3. Kalpakjian S. and Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
4. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern.
5. Principles of Metal Cutting/Principles of Machine Tools by G.C. Sen and A. Bhattacharya, New Central Book Agency, Kolkata.

CO-PO/PSO Mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3						2		2	2					
CO2	3						2		2	2					
CO3	3						2		2	2			2		2
CO4	3						2		2	2			2		2
CO5	3	2	2				2		2	2					

Paper Name: AUTO CAD Lab

Paper Code: CE291

Contact: (0:0:3)

Credit: 1.5

Prerequisite: Basic idea of Engineering drawing

Course objectives:

Impart the knowledge of CAD commands for drawing 2D building drawings required for various civil engineering applications.

Course Outcomes

CO1: Develop geometric figures using various commands

CO2: Apply preliminary settings of CAD work sheet and develop plan of various buildings

CO3: Develop views of various type of buildings with detailing

CO4: Develop plan, elevation and sections of building structures

CO5: Demonstrate computer aided drafting.

MODULE I - Introduction to Computer Aided Drafting:

3P

History – application – Advantages over manual drafting –Hard ware requirements – Soft ware requirements – Different software - Auto CAD – Pro E – IDEAS and Open-Source drafting software etc. CAD basics – main menu, starting a new drawing, open, save, save as, exit, drawing editor, entering commands using mouse, pull down menu, getting help, data entry, entity selection.

MODULE II - Draw and modifying commands:

4P

setting commands - limits of drawing, units, grid, snap, osnap, co-ordinates, ortho mode locating a point – absolute coordinate system-relative coordinate system-polar coordinate system-direct distance entry system. Draw commands- line, circle, arc, ellipse, rectangle, polygon, spline, polyline, etc. Editing commands-erase, copy, array, rotate, mirror, offset, scale move, trim, fillet, chamfer, extend, stretch, p-line edit, explode etc.

MODULE III - Working with CAD: 4P

Properties of lines – Colour, line weight, line type, layer properties - Hatch and gradients, dimensions and text on drawings - Developing simple orthographic views and dimensions it with text - Developing detailed orthographic views with all features.

MODULE IV – Development of plan, elevation and sections of building structures:

7P

Develop plan of single storied and multi storied buildings (Eg., Residential building, Library hall, Town hall, School building, Hospital building etc.); Develop elevation and sectional views of single storied and multi storied buildings (Eg., Residential building, Library hall, Town hall, School building, Hospital building etc.);

Detailing of building components like Doors, Windows, Roof Trusses etc.

TEXT BOOKS

1. AutoCAD 2014 for Engineers Vol.I - Sankarprasad Dey
2. Engineering Drawing - M.B.Shah, B.C.Rana

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	3	-	-	-	-	-	-	-	-
CO2	-	-	-	3	-	2	3	-	-	-	-	-
CO3	-	2	2	3	3	2	2	-	-	-	-	-
CO4	2	-	-	3	-	-	-	3	-	-	-	-
CO5	-	3	-	3	-	2	2	-	-	-	-	-

Paper Name: Professional Communication Lab

Paper Code: HU(CE)292

Contact: (0:0:2)

Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objectives: To train the students in acquiring interpersonal communication skills by focussing on language skill acquisition techniques and error feedback.

Course Outcome:

By pursuing this course the students will be able to:

CO1: Recognize, identify and express advanced skills of Technical Communication in English through Language Laboratory.

CO2: Understand, categorize, differentiate and infer listening, speaking, reading and writing skills in societal and professional life.

CO3: Articulate and present the skills necessary to be a competent Interpersonal communicator.

CO4: Deconstruct, appraise and critique communication behaviours.

CO5: Adapt, negotiate and facilitate with multifarious socio-economical and professional arenas with effective communication and interpersonal skills.

Course Contents:

Module 1: Introduction to the Language Lab

- a. The Need for a Language Laboratory
- b. Tasks in the Lab
- c. Writing a Laboratory Note Book

Module 2: Active Listening

- a. What is Active Listening?
- b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking
- c. Listening in Business Telephony

Module 3: Speaking

- a. Speaking—Accuracy and Fluency Parameters
- b. Pronunciation Guide—Basics of Sound Scripting, Stress and Intonation
- c. Fluency-focussed activities—JAM, Conversational Role Plays, Speaking using Picture/Audio Visual inputs
- d. Accuracy-focussed activities—Identifying Minimal Pairs, Sound Mazes, Open and Closed Pair Drilling, Student Recordings (using software)
- e. Group Discussion: Principles and Practice
- f. Giving a Presentation—Learning Presentation Basics and Giving Micro Presentations

Module 4: Lab Project Work

- a. Writing a Book Review
- b. Writing a Film Review
- c. Scripting a Short Presentation (2 minutes)
- d. Making a short video CV (1-2 minutes)

References:

- 1. IIT Mumbai, **Preparatory Course in English** syllabus
- 2. IIT Mumbai, **Introduction to Linguistics** syllabus
- 3. Sasikumar et al. *A Course in Listening and Speaking*. New Delhi: Foundation Books, 2005.
- 4. Tony Lynch, *Study Listening*. Cambridge: Cambridge UP, 2004.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	-	1	1	-	2	3	-	2
CO2	-	-	2	2	-	3	3	-	2	3	-	3
CO3	-	-	2	2	-	3	3	2	2	3	-	3
CO4	-	-	-	-	-	3	3	2	2	3	-	3
CO5	-	-	2	2	-	3	3	2	2	3	-	3

2 nd Year3 rd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE301	Surveying	3	0	0	3	3
2	ENGG	Major	CE302	Building Materials and Construction	2	0	0	2	2
3	ENGG	Major	CE303	Strength of Materials	3	0	0	3	3
4	ENGG	Major	CE304	Engineering Geology	2	0	0	2	2
5	ENGG	Minor	CS(CE)301	Computer Fundaments and prgramming	3	0	0	3	3
6	ENGG	Minor	CE305	Composite Materials	3	0	0	3	3
		B.PRACTICAL							
6	ENGG	Major	CE391	Surveying Lab	0	0	3	3	1.5
7	ENGG	Major	CE392	Engineering Geology Lab	0	0	3	3	1.5
8	ENGG	Skill enhancement Course	CS(CE)391	Computer Fundaments and prgramming Lab	0	0	3	3	1.5
9	ENGG	Major	CE393	Building Planning and drawing Lab	0	0	2	2	1.0
10	HUM	Ability Enhancement Course	HU(CE)391	Life skill	0	0	1	1	0.5
Totalof Theory,PracticalandMandatoryActivities/Courses								28	22.0

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

COURSE NAME:
SURVEYING COURSE CODE: CE
301 CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS: 3

Prerequisites: Students should have knowledge about measurement and mathematical knowledge

Course Objective: The objective of this course is appreciated of the need for lifelong learning through the discussion of recent changes in survey procedures and equipment and also have the ability to apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in surveying.

Course Outcome:

CO1	Students will summarize surveying techniques that will remain correct for long periods of time.
CO2	Students will experiment about different methods using instrument such as Chain, Compass, Leveling, minor instruments like planimeter, etc.
CO3	Students will learn about Area & Volume calculation.
CO4	Students will evaluate about Trigonometrically leveling.
CO5	Students will analyze about simple & complex problems of different instrument methods of Survey.

COURSE CONTENTS:

Module-1: [1L]

Introduction: Definition, classification of surveying, objectives, principles of surveying.

Module-2: [9L]

Chain surveying: Chain and its types, Optical square, Cross staff, Reconnaissance and site location, Locating ground features by offsets – Field book. Chaining for obtaining the outline of structures, Methods for overcoming obstacles, Conventional symbols, Plotting chain survey and Computation of areas, Errors in chain surveying and their elimination: Problems.

Compass Surveying: Details of prismatic compass, Use and adjustments, Bearings, Local attraction and its adjustments. Chain and compass surveying of an area, Booking and plotting, Adjustment of traverse, Errors in compass surveying and precautions: Problems.

Module-3:[3L]

Plane Table Surveying: Equipment, Orientation, Methods of Plane Tabling, Three Point Problems.

Module-4:[9L]

Leveling: Introduction, Basic definitions, Detail of dumpy Level, Temporary adjustment of Levels, Sensitiveness of bubble tube; Methods of leveling—Differential, Profile & fly Leveling, Effect of curvature and refraction, Automatic levels, Plotting longitudinal sections and Cross sections; Measurement of area and volume.

Contouring: Topographic Map, Characteristics of Contour, Contour Interval. Methods of Locating Contours, Interpolation of Contours.

Module-5:[9L]

Theodolite Surveying: Components of a Transit Theodolite, Measurement of horizontal and vertical Angles, Co-ordinates and traverse Table.

Tacheometry: Definition, Details of stadia System, Determination of horizontal and vertical distance with Tacheometer-Staff held vertically and normal to the line of sight.

Module-6:[3L]

Simple & Transition Curves: Definition, Degree of Curve, Elements of Simple Curve, Setting out by Linear method and Rankine's tangential method, Transition Curves.

Module-7:[3L]

Introduction to Total Station with Field

applications. Text/Reference Books:

SINo	Title	Author
1	Surveying:- Vol-I&II	B.C.Punmia
2	Surveying&Leveling	R.Subramanian(OXFORD)
3	Surveying&Leveling Vol-I[Part I&II]	T.P.Kanetkar&Kulkarni
4	Surveying:- Vol-I&II	S.K.Duggal
5	Fundamental of Engineering Survey	J.K. Ghosh(Studium Press,Roorkee)
6	Higher Surveying	Dr.A. M.Chandra
7	Surveying	R.B.Gupta&B.K.Gupta
9	Plane and Geodetic Surveying (Vol-I&II)	David Clark
10	Fundamental of Surveying	S.K.Roy
11	Surveying	Saikia & Das(PHI)

CO-POmapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	1	1	1	3	3	3	3	3	3	3
CO2	3	3	3	2	2	2	1	2	3	2	3	2	2	3	2
CO3	1	1	1	-	-	-	-	-	1	1	1	1	1	1	1
CO4	3	3	3	3	2	2	2	1	3	2	2	2	2	2	2
CO5	3	3	3	3	2	1	1	1	3	2	1	2	2	2	2

COURSE NAME: BUILDING MATERIALS AND CONSTRUCTION

COURSE CODE: CE302

CONTACT: 2:0:0

TOTAL CONTACT HOURS: 24 HRS

CREDITS: 2

Prerequisites: No Pre-Requisite required (NPR)

Course Objective: The objective of this course is to know the student about the basic building materials, properties and their applications, to know the smart building materials, external paints and their uses to understand different types of masonries and their applications

Course Outcome:

CO1	Students will summarize basic knowledge about various kinds of materials used in construction work.
CO2	Students will differentiate about different types of building foundation i.e. shallow and deep foundation, their mechanisms and uses.
CO3	Summarize knowledge about various structural members of a building like walls, door, window, stair, flooring, roof etc.
CO4	Extend to apply their knowledge at the time of decision making for application of structural member including material used.

COURSE CONTENTS:

Module-1: [9L]

Bricks: Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick Earth, Different forms of bricks, testing of bricks as per BIS. Defects of bricks. Flyash bricks [2L+1T]

Aggregates: Classification, Characteristics, Deleterious substances, Soundness, Alkali – aggregates reaction, Fine aggregates, coarse aggregates, testing of aggregates [2L+1T]

Lime: Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling, **Cement:** OPC: Composition, PPC, Slag cement, Hydration, setting time **Concrete:** Types, ingredients, W/C ratio, Workability, Different grades in cement concrete, Tests on cement concrete [2L+1T]

Module-2: [9L]

Mortars: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars [2L+1T]

Wood and Wood Products: Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Preservation of

Timber Testing of Timber, Veneers , Plywood, Fibre Boards, Particle Boards, Chip Boards ,Black Boards, Button Board and Laminated Boards, Applications of wood and wood products[2L+1T]

Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint,preparation of paint,coveringpower of paints,Painting:Plastered surfaces,paintingwood,surfaces,paintingmetalSurfaces.Defects,Effec tofweather,enamels,distemper,waterwashandcolourwash,Varnish,French Polish,WaxPolish.**Miscellaneous Materials:**Gypsum:Classification, PlasterofParis,Heatandsoundinsulatingmaterials,Geo-synthetics[2L+1T]

Module-3:[9L]

Foundations: Function of Foundations, Essential requirement of good foundation, Differenttypes of shallow and deep Foundations. Uses of Spread foundation, pile and well foundation[2L+1T]

Brick masonry: Definitions, Rules for bonding, Type of bonds – stretcher bond, Header bond,English bond, Flemish Bond, Comparison of English Bond and Flemish Bond (one and one andhalfbrickthickwall).Cavitywall[2L+1T]

Wall, Doors and Windows: Load bearing wall, Partition wall, Reinforced brick wall Commontypesofdoors andwindowsoftimberandmetal [2L+1T]

Module-4[9L]

Stairs:TechnicalTerms,Requirementsofgoodstair,Dimensionofsteps,Classification,Geometric design of a dog legged stair case, Elevation and cross section of different type of staircases.[2L+1T]

Flooring:Componentsofafloor,selectionofflooringmaterials,Brickflooring,Cementconcreteflo oring,mosaic,marble,Terrazzo flooring,Tiledroofing[2L+1T]

Plastering and Pointing: Plastering with cement mortar, Defects in plastering, pointing, whitewashing, colour washing, Distempering, **Roofs:** Types, Pitched roofs and their sketches, Lean –to roof, coupled and collared roofs, King Post – Truss, Queen post truss and Simple steel Truss ,RoofCoveringmaterials:AC sheets GIsheet[2L+1T]

[illegible]

COURSE NAME: STRNGTH OF MATERIALS

COURSE CODE: CE303

CONTACT: 3:0:0

TOTAL CONTACT HOURS: 36 HRS

CREDITS: 3

Prerequisites: Students should have the knowledge about Elements of Civil Engineering & Mechanics.

Course Objective: The objective of this course is elaborate on the knowledge of engineering mechanics (statics) and to teach the students the purpose of studying strength of materials with respect to civil engineering design and analysis. The course introduces the students to the concepts of engineering mechanics of materials and the behavior of the materials and structures under applied loads.

Course Outcome:

CO1	Interpret the concepts of stress and strain at a point as well as the stress-strain relationships for homogeneous, isotropic materials.
CO2	Analyze the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
CO3	Demonstrate the capability to conduct experiments, as well as to analyze and interpret data
CO4	Ability to classify a component to meet desired needs within realistic constraints of safety.

COURSE CONTENTS:

Module-1: [6L]

Review of Basic Concepts of Stress and Strain: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Bulk Modulus; Factor of safety. Beam Statics: Support reactions, concepts of redundancy, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams **Module-2: [9L]**

Symmetric Beam Bending: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, Bending and shear stress for regular sections, shear centre, centre of gravity [3L+2T]

Deflection of statically determinate beams: Fundamental concepts: Elastic curve, moment-curvature relationship, governing differential equation, boundary conditions: Direct integration solution [3L+1T]

Module-3: [10L]

Analysis of determinate plane trusses: Concepts of redundancy, Analysis by method of joints,

Method of sections.[3L+1T]

Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle, applications.[4L+2T]

Module-4:[11L]

Introduction to thin cylindrical & spherical shells: Hoop stress and meridional stress and volumetric changes.[2L+2T]

Torsion: Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical springs[2L+1T]

Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae.[3L+1T]

Text/ Reference Books:

SINo	Name	Author	Publisher
1	Elements of Strength of Material	S.P.Timoshenko & D.H.	EWPPvt.Ltd
2	Engineering Mechanics of Solids	E.P.Popov	Pearson Education
3	Strength of Materials	R.Subramanian	OXFORD University Press
4	Strength of Material	S SBhavikatti	Vikas Publishing House Pvt.Ltd
5	Engineering Mechanics I by	J.L.Mariam	John Willey
6	Engineering Mechanics	I.H.Shames	PHI
7	Fundamentals of Strength of Material	Nag & Chandra	WIE

CO-PO mapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	1	-	2	2	3	2
CO2	3	3	3	2	1	-	-	-	-	1	-	3	2	3	2
CO3	2	3	3	3	1	1	-	-	1	1	1	2	2	3	2
CO4	3	2	3	3	1	-	2	-	-	-	-	1	2	3	2

COURSENAME:ENGINEERINGGEOLOGY
COURSECODE:CE304
CONTACT:2:0:0
TOTAL CONTACT HOURS: 24HRS
CREDITS:3

Prerequisites:BasicknowledgeofGeography&EarthScience

CourseObjective:

Tomakethestudentsknowledgeabletounderstand,applyandexploreGeologicalparameters,Roc
 kandothmaterialsandactivityrelatedtoearthscience.

CourseOutcome:

CO1	StudentswillhaveknowledgeaboutEngineeringpropertiesofRocksandtheir Minerals.
CO2	StudentwillbeappraisedaboutDam,reservoir,tunnel
CO3	StudentwillunderstandaboutEarthquakephenomena.
CO4	Student willabletocarryout Physicalexploration
CO5	Studentwillabletoestimatevariousgeologicalparametersbyuseofmoderntools&techni ques

COURSECONTENTS:

Module-1:[2L+1T]

GeologyanditsimportanceinCivilEngineering

Module-2:[2L+1T]

Mineralogy:Definition,internalandexternalstructureofminerals,
 Classificationandphysicalpropertiesofminerals.

Module-3:[2L+1T]

Classificationofrocks:

- a) Igneousrocks:Origin,modeofoccurrence,forms&texture,classificationandengineeringim portance.
- b) Sedimentaryrocks:Processofsedimentation, classificationandengineeringimportance.
- c) Metamorphicrocks:Agentsandtypesofmetamorphism,classificationandengineeringi mportance.

Module-4:[2L+1T]

Weathering of rocks: Agents and kinds of weathering, soil formation & classification based onorigin.

Module-5:[2L+1T]

Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition.

Module-6:[2L+1T]

Structural geology: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering.

Module-7:[2L+1T]

Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercalli's intensity scale and Richter's scale of magnitude

Module-8:[2L+1T]

Engineering properties of rocks:

Porosity, permeability, compressive strength, tensile strength and abrasive resistance

Module-9:[2L+1T]

Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing

Module-10:[2L+1T]

Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method field procedure –sounding and profiling, electrode configuration, interpretation of resistivity data. Geophysical surveys in groundwater and other Civil Engg. Projects.

Module-11:[2L+1T]

Applied Geology: Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations.

Module-12:[2L+1T]

Landslides: Types of landslides, causes, effects and prevention of landslides

Text/ReferenceBooks:

Slno	Name	Author	Publisher
1	Engineering and GeneralGeology	ParvinSingh	KatsonhouseDelhi1987
2	Engineering Geology for CivilEngineers	D.VenkatReddy	Oxford,IBH,1995.
3	Principlesofpetrology	Tyrell	Asia, Bombay
4	StructuralGeology	MarlandP.Billings	WileyeasternPrentice-Hall,U.S.A.
5	GroundWater hydrology	ToddD.K.	John Wiley & Sons,Secondedition,1980.

CO-POmapping

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	-	1	1	1	1	1	2	2	2	-
CO2	3	2	1	2	1	-	1	1	1	1	1	2	2	2	-
CO3	3	2	2	2	2	1	1	1	1	1	1	-	2	2	-
CO4	3	3	3	3	3	-	-	1	-	2	1	1	2	2	-
CO5	3	2	1	3	3	2	1	1	2	2	1	2	2	2	-

COURSE NAME: COMPUTER FUNDAMENTALS AND PROGRAMMING
COURSE CODE: CS(CE) 301
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36
CREDIT: 3

Prerequisites: Number system, Boolean Algebra

Course Outcome:

- CO 1** Understand and differentiate among different programming languages for problem solving.
- CO 2** Describe the way of execution and debug programs in C language.
- CO 3** Define, select, and compare data types, loops, functions to solve mathematical and scientific problems.
- CO 4** Understand the dynamic behavior of memory by the use of pointers.
- CO 5** Design and develop modular programs using control structure, selection structure and file.

Course Contents

Module	Syllabus	Contact Hours
1. Fundamentals of Computer	History of Computer, Generation of Computer, Classification of Computers, Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Number System: basic of Binary, Octal, Decimal and Hexadecimal number systems; Representation and interchanging of number in different number systems. Introduction to complements system, Representation of signed and unsigned numbers in signed magnitude, signed 1's complement system and signed 2's complement system. Arithmetic – Addition and Subtraction (using 1's complement and 2's complement). Representation of Characters-ASCII Code Basics of Compiler, Interpreter and Assembler Problem solving – Basic concept of Algorithm. Representation of algorithm using flow chart and pseudo code. Some basic examples	9
2. Introduction to C Programming	Overview of Procedural vs Structural language; History of C Programming Language. Variable and Data Types: The C character set, identifiers and keywords, data type & sizes, variable names, declaration, statements. Operators & Expressions: Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators-type conversion, C expressions, precedence and associativity. Input and Output: Standard input and output, formatted output – printf, formatted input scan f.	5
3. Branch and Loop	Branching: Concept of Statement and Blocks in C, Simple if, if-else, nested if-else and if-else ladder. Switch Case: break and continue; switch-case, concept of goto and labels Loops - while, for, do while	5
4. Program Structures	Function: Basics of Functions, function types, function prototypes, formal and actual parameter, function calling, functions returning values, functions not returning values. Recursion and Recursive Function. Storage Class in C: Storage Class-auto, external, static and register storage	4

1. ByronGottfried,Schaum'sOutlineofProgrammingwithC,McGraw-Hill
2. KanetkarY.-LetusC,BPBPpublication,15thEdition

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall of

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C01	3	3	3	2	2								3	3	3
C02	3	2	2	2	2								3	3	3
C03	3	3	3	2	2								3	3	3
C04	3	3	3	2	2								3	3	3
C05	3	3	3	2	2								3	3	3

COURSE NAME: COMPOSITE MATERIALS

COURSE CODE: CE305

CONTACT: 3:0:0

TOTAL CONTACT HOURS: 36

CREDIT: 3

Prerequisite: Engineering Materials

Course Outcomes:

CO1: Know the structure and basic properties of composite and nano-composite materials.

CO2: Explore and understand the several methods of composite fabrication.

CO3: Predict the characteristics and performance of composite materials.

CO4: Apply varying composite materials in automotive, aerospace and other applications.

Course Contents

Module No.	Syllabus	Contact Hrs.
1	Introduction to composites: Definition and applications of composite materials, Fibers-glass, carbon, ceramic and aramid fibers; Matrices polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Lamina-assumptions, macroscopic viewpoint, generalized Hookes law, reduction of homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness.	10
2	Characterization of Composites: Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, crossply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai-Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates	10
3	Performance Analysis of Composites: Analysis of laminated plates equilibrium equations of motion, energy formulation, static bending analysis, buckling analysis, free vibrations, natural frequencies	8
4	Fabrication and application of Composites: Manufacturing of composite materials, bag molding, compression molding, pultrusion, filament winding, other manufacturing processes, Industrial Application of Composite Materials	8

Text Books:

1. Composite materials, K.K. Chawala, 2nd ed., (1987) Springer-Verlag, New York.
2. Nanocomposite Science and Technology, P. M. Ajayan, L. S. Schadler, P. V. Braun, (2003), Wiley-VCH Verlag GmbH Co. KGaA, Weinheim.
3. Mechanics and Analysis of Composite Materials, V.V. Vasiliev and E.V. Morozov, (2001), Elsevier Science Ltd, The Boulevard, Kidlington, Oxford OX5Lgb, UK.
4. Ceramic matrix composites, K.K. Chawala, 1st ed., (1993) Chapman & Hall, London

CO-PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	-	-	-	-	-	1	-	-	2	-	2
CO2	2	-	1	2	1	-	-	1	-	1	2	1	2	-	2
CO3	2	2	2	1	1	1	-	-	-	1	1	1	2	-	2
CO4	2	1	2	2	1	1	-	1	-	1	2	3	2	-	2

COURSENAME:SURVEYINGLAB

COURSECODE:CE 391

CONTACT:0:0:3

CREDITS :1.50

Prerequisites: Students should have knowledge about the basic Basic Survey Theory

Course Objective: Student will be able to function as a member of a team and have the ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcome:

CO1	To interpret horizontal measurement with the help of Chain & Compass Surveying in the field.
CO2	To enumerate about Plane Table surveying.
CO3	To estimate vertical measurement with the help of Leveling in the field.
CO4	To apply indirect methods & demonstration of minor instruments.
CO5	To apply knowledge about Theodolite & Curve.

LIST OF EXPERIMENT:

Chainsurveying

Preparing index plans, Location sketches, Ranging, Preparation of map, Getting outline of the structures by enclosing them in triangles/quadrilaterals, Distance between inaccessible points, Obstacles in chain survey.

Compass surveying

Measurement of bearings, Preparation of map, Distance between two inaccessible points by chain and compass, Chain and compass traverse

Plane Table survey

Temporary adjustments of plane table and Radiation, Intersection, Traversing/Resection methods.

Leveling

Reduced Level calculation with Dumpy and Auto level for Differential leveling, Profile leveling and plotting the profile,

Contouring:

Direct contouring, Indirect contouring (Method of Interpolation).

Theodolite Traversing by using Theodolite. Measurements of Horizontal & Vertical angles.

Circular Curves - Setting out of Simple Circular Curves.

Text/Reference Books:

SIN o.	Title	Author
1	Surveying:- Vol-I&II	B.C.Punmia
2	Surveying&Leveling	R.Subramanian(OXFORD)
3	Surveying&Leveling Vol-I[Part I&II]	T.P.Kanetkar&Kulkarni
4	Surveying:- Vol-I&II	S.K.Duggal
5	Fundamental of Engineering Survey	J.K. Ghosh(Studium Press, Roorkee)
6	Higher Surveying	Dr.A. M.Chandra
7	Surveying	R.B.Gupta&B.K.Gupta
9	Plane and Geodetic Surveying (Vol-I&II)	David Clark
10	Fundamental of Surveying	S.K.Roy
11	Surveying	Saikia & Das(PHI)

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	2	1	1	3	2	2	1	3	3	3
CO2	3	3	3	-	-	2	1	1	3	3	3	1	3	3	3
CO3	3	3	3	-	-	2	1	1	3	2	3	1	3	3	3
CO4	3	3	3	-	1	2	1	1	3	3	3	2	3	2	3
CO5	3	3	3	-	1	2	1	1	3	2	3	2	3	3	3

COURSE NAME: ENGINEERING GEOLOGY LAB**COURSE CODE: CE392****CONTACT: 0:0:3****CREDITS: 1.5****Prerequisites:** Students should have the knowledge about Engineering geology theory.**Course Objective:**

To make the students capable to identify and study properties of rocks and minerals. They also should be able to use modern tools like microscope.

Course Outcome:

CO1	Students should acquire knowledge about engg. Properties of rocks and their minerals.
CO2	Students should be able to identify rocks and minerals
CO3	Students should be able to use modern tools like microscope to explore samples.
CO4	Students should be able to interpret map.

LIST OF EXPERIMENT:

Identification of Rocks and Minerals [Hand Specimens]
Identification of Rocks and Minerals [Hand Specimens]

Study of Geological maps, interpretation of geological structures
Thickness problems, Borehole problems

Text/Reference Books:

Sno	Name	Author	Publisher
1	Engineering and General Geology	Parvin Singh	Katson publishing house Delhi 1987
2	Engineering Geology for Civil Engineers	D. Venkat Reddy	Oxford, IBH, 1995.
3	Principles of Petrology	Tyrell	Asia, Bombay
4	Structural Geology	Marland P. Billings	Wiley Eastern Prentice-Hall, U.S.A.
5	Ground Water hydrology	Todd D.K.	John Wiley & Sons, Second edition, 1980.

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	-	1	1	1	1	1	1	2	2	-
CO2	3	2	2	3	2	1	2	-	1	1	-	1	2	2	-
CO3	2	2	1	3	3	2	-	1	1	1	1	1	2	2	-
CO4	2	2	2	1	1	3	1	1	-	1	-	1	2	2	-

COURSENAME: COMPUTER FUNDAMENTALS AND PROGRAMMING LAB

COURSECODE:CS(CE)391

CONTACT:0:0:3

CREDITS: 1.5

Prerequisites: Number system, Boolean Algebra

Course Outcomes (COs):

After completion of the course students would be able to,

CO1: Understand and propose appropriate command or function in the running system or developing program for engineering and mathematical problems depending on the platform used even in a changed environment leading to their lifelong learning.

CO2: Identify and propose appropriate data type, arithmetic operators, input/output functions and also conditional statements in designing effective programs to solve complex engineering problem using modern tools.

CO3: Design and develop effective programs for engineering and mathematical problems using iterative statements as well as recursive functions using modular programming approach possibly as a team maintaining proper ethics of collaboration.

CO4: Explain and organize data in arrays, strings and structures and manipulate them through programs and also define pointers of different types and use them in defining self-referential structures and also to construct and use files for reading and writing to and from leading to solution of engineering and mathematical problem.

CO5: Prepare laboratory reports on interpretation of experimental results and analyse it for validating the same maintaining proper ethics of collaboration.

CourseContent:

Module-1: Familiarization with some basic commands of DOS and Linux. File handling and Directory structures, file permissions, creating and editing simple C program in different editor and IDE, compilation and execution of C program. Introduction to Codeblock.

Module-2: Problem based on

- a) Basic data types
- b) Different arithmetic operators.
- c) Printf() and scanf() functions.

Module-3: Problem based on conditional statements using

- a) if-else statements
- b) different relational operators
- c) different logical operators

Module-4: Problem based on

- a) **for** loop
- b) **while** loop
- c) **do-while** loop

Module-5: Problem based on

- a) How to write a menu driven program using **switch-case** statement
- b) How to write a function and passing values to a function
- c) How to write a **recursive function**.

Module-6: Problem based on

- a) How to use array (**both 1-D and 2-D**).
- b) How to pass an array to a function.

Module-7: Problem based on manipulation of strings in different way.

Module-8: Problem based on

- a) How to handle compound variables

1. ByronGottfried,Schaum'sOutlineofProgrammingwithC,McGraw-Hill
2. KanetkarY.-LetusC,BPBPPublication,15thEdition

ReferenceBooks:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. KR Venugopal & S R Prasad – MASTERING C, TMH, 2nd Edition

CO-PO/PSOMapping:

[illegible]

COURSENAME:BUILDINGPLANNINGANDDRAWING LAB																
COURSECODE:CE393																
CONTACT:0:0:2																
CREDITS:1.0																
Prerequisites: Studentshouldhaveknowledgeaboutbuilding materialsandconstructionandalso mathematics																
CourseObjective: TheobjectiveofthiscourseistomakestudentabletoLearntosketchandtakefielddimension sand totakedataandtransformitintographicdrawingsandAutoCadskills.																
CourseOutcome: CO1 Preparesimplelayoutofbuildings. CO2 Produceworkingdrawingsfor individualcomponents likedoorsandwindowsetc. CO3 Developlinediagram, buildingsection,elevation, keyplanandsectionalelevation. CO4 Illustratehanddraftinganypartsofabuildingandimplementtheregulationsfor layoutofplan.																
LISTOFEXPERIMENT:																
Foundations- Spreadfoundationforwallsandcolumns;Footing foraRCCcolumn,raftandpilefoundations																
Doorsand Windows - Glazed andpaneled doorsofstandardsizes;Glazed and paneled windowsofstandardsizes;specialwindowsandventilators																
Stairs- Proportioning and design of a dog-legged, open well RCC stair case for an office / Residentialbuilding; Details of reinforcements for RCC stair cases; Plan and elevation of straight run, quarter turn,dog-leggedandopenwellstaircases.																
Roofs- Typesofslopingroof,lean-toroofs,RCCroofwithdetailsofreinforcements																
Trusses- KingpostandQueenposttrusses.																
Functional Design of Buildings- To draw the line diagram, plan, elevation and section of thefollowing: Residential Buildings (flat & pitched roofs), Office Buildings (flat roof), School.The designs mustshowpositionsofvariouscomponentsincluding liftwellandtheirsizes.Introductiontodrawingbyusingsoftwarepackage.																
Text/ReferenceBooks:																
SINo		Title										Author				
1		PrinciplesofBuildingDrawing										Shah&Kale				
2		TextBookofBuildingConstruction										Sharma& Kaul				
3		BuildingConstruction										BCPunmia				
4		Civilengineeringdrawing										M.Chakraborty				
CO-POmapping																
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2	PSO2 3	0 1	
CO1	3	2	-	1	2	-	-	-	-	1	-	-	1	2	2	-
CO2	3	2	-	1	2	-	-	-	-	1	-	-	1	2	2	-
CO3	3	2	-	1	2	-	-	-	-	1	-	-	1	2	2	-
CO4	3	2	-	1	2	-	-	-	-	1	-	-	1	2	2	-

COURSENAME:LIFE SKILL

COURSECODE:HU(CE)391

CONTACT:0:0:1

CREDITS:0.5

Pre-requisites: Basic(10+2)

Course Outcome:

CO1: It will equip the student to handle workplace interpersonal communication in an effective manner.

CO2: To enable students with strong oral and written interpersonal communication skills.

CO3: To prepare students to critically analyze workplace situations and take appropriate decisions.

CO4: To make students campus ready through proper behavioral and interpersonal grooming.

CO5: Integration of enhanced skill set to design and frame team based Project Report and Presentation.

MODULE I – INTERPERSONAL COMMUNICATION

1. The skills of InterpersonalCommunication.
2. Gender/Culture Neutrality.
3. Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE II- INTERPERSONAL COMMUNICATION BASED ON WORKPLACE COMMUNICATION

4. Workplace Communication.
5. Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.)
6. Communication with Clients, Customers, Suppliers etc.
7. Organizing/Participating in Business Meeting.
8. Note Taking.
9. Agenda.
10. Minutes.

MODULE III – BUSINESS ETIQUETTE AND CORPORATE LIFE

11. Presenting oneself in the Business Environment.
12. Corporate Dressing and Mannerism.
13. Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
14. E-mail Etiquette.
15. Activity based Case Study.

MODULE IV – TEAM WORK: : CORPORATE BUSINESS MEETING

16. Team based Brainstorming.
17. Documentation and Scripting.
18. People and Time Management
19. Advertisement Review: Feedback and Analysis

List of Reference:

1. Interpersonal Communication, Peter Hartley, Routledge, 1993.

2. Workplace Vagabonds: Career and Community in Changing Worlds of Work, Christina Garsten, Palgrave Macmillan, 2008.

3. Transnational Business Cultures Life and Work in a Multinational Corporation, Fiona Moore, Ashgate, 2005.

4. Global Business Etiquette: A Guide to International Communication and Customs, Jeanette S. Martin and Lillian H. Chaney, Praeger Publishers, 2006.

5. Making Teams Work: 24 Lessons for Working Together Successfully, Michael Maginn,

McGraw-Hill, 2004.

6. *Corporate Communications: Convention, Complexity, and Critique*, Lars Thøger Christensen, Mette Morsing and George Cheney, SAGE Publications Ltd., 2008.

7. *The Business Meetings Sourcebook: A Practical Guide to Better Meetings and Shared Decision Making*, Eli Mina, AMACOM, 2002.

8. *Moving Images: Making Movies, Understanding Media*, Carl Casinghino, Delmar, 2011.

CO-PO Mapping

COs POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	-	-	-	-	3	-	2	-	-	2
CO2	-	-	-	-	-	-	-	-	-	3	-	2	-	-	2
CO3	-	-	-	-	-	-	-	-	-	3	-	2	-	-	2
CO4	-	-	-	-	-	-	-	-	-	3	-	2	-	-	2
CO5	-	-	-	-	-	-	-	-	-	3	-	2	-	-	2

2nd Year 4th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE401	Concrete Technology	3	0	0	3	3
2	ENGG	Major	CE402	Structural Analysis	4	0	0	4	4
3	ENGG	Major	CE403	Soil Mechanics	3	0	0	3	3
4	ENGG	Minor	M(CE)401	Numerical Methods	3	0	0	3	3
B.PRACTICAL									
5	ENGG	Major	CE491	Concrete Technology Lab	0	0	3	3	1.5
6	ENGG	Major	CE492	Soil Mechanics Lab-I	0	0	3	3	1.5
7	ENGG	Major	CE493	Quantity Surveying, Specifications and Valuation	0	0	2	2	1.0
8	ENGG	Minor	CS(CE)491	Numerical Methods Lab	0	0	3	3	1.5
9	ENGG	Internship	CE494	Industrial Training (min 1 weeks)	0	0	2	2	1.0
10	HUM	Ability Enhancement Course	HU(CE)491	Quantitative Aptitude: Numerical & Logical reasoning	1	0	0	1	0.5
Total of Theory, Practical and Mandatory Activities/Courses								27	20

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

COURSE NAME: CONCRETE TECHNOLOGY C COURSE CODE: CE 401 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSCREDITS: 3	
Pre requisites: Students should have knowledge about the building materials and construction.	
Course Objective: The objective of this course is to produce knowledge to the student in ingredients of concrete, specific	
Course Outcome: <ul style="list-style-type: none"> CO1 Identify the functional role of ingredients of concrete CO2 Students should be able to gather knowledge to mix design philosophy CO3 Student will be able to differentiate various types of cement used for various specific purpose CO4 Student will be able to apply fundamental knowledge in the fresh and hardened properties of concrete CO5 Student will be able to design ordinary and control concretes, replacement of cement and their specific applications 	
Course contents:	
<u>Module-1:[6L]</u> <u>Introduction:-</u> Concrete as a Structural Material, Good Concrete Manufacture of Portland Cement, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration [4L]	6L
<u>Module-2:[9L]</u> <u>Types of Cement:-</u> ordinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, super sulphated cement, white cement. Tests on cement and cement paste – fineness, consistency, setting time, soundness, strength. [3L] <u>Water & Aggregates:-</u> Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modulus, Grading Requirements. Testing of Aggregates – Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value. Quality of Water – Mixing Water, Curing Water, Harmful Contents. [3L]	9L

<p><u>Module-3:[11L]</u></p> <p><u>Properties of Fresh Concrete</u>– Workability, Factors Affecting Workability, Slump Test Compacting Factor Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, curing, Methods, Maturity. [3L]</p> <p><u>Strength & durability of Concrete</u>– Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modules of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, <u>Cylinders, Non-Destructive Tests. [3L]</u></p>	11L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
<p><u>Module-4:[10L]</u></p> <p><u>Permeability of concrete</u>, Chloride & Sulphate attack on concrete, carbonation of concrete [2L]</p> <p>Admixtures – different types (chemical and mineral), effects, uses, Retarders and Super plasticizers. Mix Design by I.S. 10262(2009) Code method. [4L]</p> <p><u>Special concrete:</u> Light-weight, Polymer and Fiber-reinforced concrete. [2L]</p>	10L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
<p><u>Text/Reference Books:</u></p> <table border="1" data-bbox="197 1178 1342 1464"> <thead> <tr> <th>SLNO</th><th>NAME</th><th>Author</th><th>publisher</th></tr> </thead> <tbody> <tr> <td>1</td><td>Concrete Technology</td><td>Neville</td><td>Pearson Education</td></tr> <tr> <td>2</td><td>Concrete Technology</td><td>M.S.Shetty</td><td>S.Chand</td></tr> <tr> <td>3</td><td>Concrete Technology</td><td>A.R.Santakumar</td><td>OXFORD University Press</td></tr> <tr> <td>4</td><td>Concrete Technology</td><td>M.L.Gambhir</td><td>Tata McGraw Hill</td></tr> <tr> <td>5</td><td>Textbook of Concrete Technology</td><td>P.D.Kulkarni</td><td>Tata McGraw Hill</td></tr> </tbody> </table>		SLNO	NAME	Author	publisher	1	Concrete Technology	Neville	Pearson Education	2	Concrete Technology	M.S.Shetty	S.Chand	3	Concrete Technology	A.R.Santakumar	OXFORD University Press	4	Concrete Technology	M.L.Gambhir	Tata McGraw Hill	5	Textbook of Concrete Technology	P.D.Kulkarni	Tata McGraw Hill																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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PO391	PO392	PO393	PO394	PO395	PO396	PO397	PO398	PO399	PO400	PO401	PO402	PO403	PO404	PO405	PO406	PO407	PO408	PO409	PO410	PO411	PO412	PO413	PO414	PO415	PO416	PO417	PO418	PO419	PO420	PO421	PO422	PO423	PO424	PO425	PO426	PO427	PO428	PO429	PO430	PO431	PO432	PO433	PO434	PO435	PO436	PO437	PO438	PO439	PO440	PO441	PO442	PO443	PO444	PO445	PO446	PO447	PO448	PO449	PO450	PO451	PO452	PO453	PO454	PO455	PO456	PO457	PO458	PO459	PO460	PO461	PO462	PO463	PO464	PO465	PO466	PO467	PO468	PO469	PO470	PO471	PO472	PO473	PO474	PO475	PO476	PO477	PO478	PO479	PO480	PO481	PO482	PO483	PO484	PO485	PO486	PO487	PO488	PO489	PO490	PO491	PO492	PO493	PO494	PO495	PO496	PO497	PO498	PO499	PO500	PO501	PO502	PO503	PO504	PO505	PO506	PO507	PO508	PO509	PO510	PO511	PO512	PO513	PO514	PO515	PO516	PO517	PO518	PO519	PO520	PO521	PO522	PO523	PO524	PO525	PO526	PO527	PO528	PO529	PO530	PO531	PO532	PO533	PO534	PO535	PO536	PO537	PO538	PO539	PO540	PO541	PO542	PO543	PO544	PO545	PO546	PO547	PO548	PO549	PO550	PO551	PO552	PO553	PO554	PO555	PO556	PO557	PO558	PO559	PO560	PO561	PO562	PO563	PO564	PO565	PO566	PO567	PO568	PO569	PO570	PO571	PO572	PO573	PO574	PO575	PO576	PO577	PO578	PO579	PO580	PO581	PO582	PO583	PO584	PO585	PO586	PO587	PO588	PO589	PO590	PO591	PO592	PO593	PO594	PO595	PO596	PO597	PO598	PO599	PO600	PO601	PO602	PO603	PO604	PO605	PO606	PO607	PO608	PO609	PO610	PO611	PO612	PO613	PO614	PO615	PO616	PO617	PO618	PO619	PO620	PO621	PO622	PO623	PO624	PO625	PO626	PO627	PO628	PO629	PO630	PO631	PO632	PO633	PO634	PO635	PO636	PO637	PO638	PO639	PO640	PO641	PO642	PO643	PO644	PO645	PO646	PO647	PO648	PO649	PO650	PO651	PO652	PO653	PO654	PO655	PO656	PO657	PO658	PO659	PO660	PO661	PO662	PO663	PO664	PO665	PO666	PO667	PO668	PO669	PO670	PO671	PO672	PO673	PO674	PO675	PO676	PO677	PO678	PO679	PO680	PO681	PO682	PO683	PO684	PO685	PO686	PO687	PO688	PO689	PO690	PO691	PO692	PO693	PO694	PO695	PO696	PO697	PO698	PO699	PO700	PO701	PO702	PO703	PO704	PO705	PO706	PO707	PO708	PO709	PO710	PO711	PO712	PO713	PO714	PO715	PO716	PO717	PO718	PO719	PO720	PO721	PO722	PO723	PO724	PO725	PO726	PO727	PO728	PO729	PO730	PO731	PO732	PO733	PO734	PO735	PO736	PO737	PO738	PO739	PO740	PO741	PO742	PO743	PO744	PO745	PO746	PO747	PO748	PO749	PO750	PO751	PO752	PO753	PO754	PO755	PO756	PO757	PO758	PO759	PO760	PO761	PO762	PO763	PO764	PO765	PO766	PO767	PO768	PO769	PO770	PO771	PO772	PO773	PO774	PO775	PO776	PO777	PO778	PO779	PO780	PO781	PO782	PO783	PO784	PO785	PO786	PO787	PO788	PO789	PO790	PO791	PO792	PO793	PO794	PO795	PO796	PO797	PO798	PO799	PO800	PO801	PO802	PO803	PO804	PO805	PO806	PO807	PO808	PO809	PO810	PO811	PO812	PO813	PO814	PO815	PO816	PO817	PO818	PO819	PO820	PO821	PO822	PO823	PO824	PO825	PO826	PO827	PO828	PO829	PO830	PO831	PO832	PO833	PO834	PO835	PO836	PO837	PO838	PO839	PO840	PO841	PO842	PO843	PO844	PO845	PO846	PO847	PO848	PO849	PO850	PO851	PO852	PO853	PO854	PO855	PO856	PO857	PO858	PO859	PO860	PO861	PO862	PO863	PO864	PO865	PO866	PO867	PO868	PO869	PO870	PO871	PO872	PO873	PO874	PO875	PO876	PO877	PO878	PO879	PO880	PO881	PO882	PO883	PO884	PO885	PO886	PO887	PO888	PO889	PO890	PO891	PO892	PO893	PO894	PO895	PO896	PO897	PO898	PO899	PO900	PO901	PO902	PO903	PO904	PO905	PO906	PO907	PO908	PO909	PO910	PO911	PO912	PO913	PO914	PO915	PO916	PO917	PO918	PO919	PO920	PO921	PO922	PO923	PO924	PO925	PO926	PO927	PO928	PO929	PO930	PO931	PO932	PO933	PO934	PO935	PO936	PO937	PO938	PO939	PO940	PO941	PO942	PO943	PO944	PO945	PO946	PO947	PO948	PO949	PO950	PO951	PO952	PO953	PO954	PO955	PO956	PO957	PO958	PO959	PO960	PO961	PO962	PO963	PO964	PO965	PO966	PO967	PO968	PO969	PO970	PO971	PO972	PO973	PO974	PO975	PO976	PO977	PO978	PO979	PO980	PO981	PO982	PO983	PO984	PO985	PO986	PO987	PO988	PO989	PO990	PO991	PO992	PO993	PO994	PO995	PO996	PO997	PO998	PO999	PO1000	PO1001	PO1002	PO1003	PO1004	PO1005	PO1006	PO1007	PO1008	PO1009	PO1010	PO1011	PO1012	PO1013	PO1014	PO1015	PO1016	PO1017	PO1018	PO1019	PO1020	PO1021	PO1022	PO1023	PO1024	PO1025	PO1026	PO1027	PO1028	PO1029	PO1030	PO1031	PO1032	PO1033	PO1034	PO1035	PO1036	PO1037	PO1038	PO1039	PO1040	PO1041	PO1042	PO1043	PO1044	PO1045	PO1046	PO1047	PO1048	PO1049	PO1050	PO1051	PO1052	PO1053	PO1054	PO1055	PO1056	PO1057	PO1058	PO1059	PO1060	PO1061	PO1062	PO1063	PO1064	PO1065	PO1066	PO1067	PO1068	PO1069	PO1070	PO1071	PO1072	PO1073	PO1074	PO1075	PO1076	PO1077	PO1078	PO1079	PO1080	PO1081	PO1082	PO1083	PO1084	PO1085	PO1086	PO1087	PO1088	PO1089	PO1090	PO1091	PO1092	PO1093	PO1094	PO1095	PO1096	PO1097	PO1098	PO1099	PO1100	PO1101	PO1102	PO1103	PO1104	PO1105	PO1106	PO1107	PO1108	PO1109	PO1110	PO1111	PO1112	PO1113	PO1114	PO1115	PO1116	PO1117	PO1118	PO1119	PO1120	PO1121	PO1122	PO1123	PO1124	PO1125	PO1126	PO1127	PO1128	PO1129	PO1130	PO1131	PO1132	PO1133	PO1134	PO1135	PO1136	PO1137	PO1138	PO1139	PO1140	PO1141	PO1142	PO1143	PO1144	PO1145	PO1146	PO1147	PO1148	PO1149	PO1150	PO1151	PO1152	PO1153	PO1154	PO1155	PO1156	PO1157	PO1158	PO1159	PO1160	PO1161	PO1162	PO1163	PO1164	PO1165	PO1166	PO1167	PO1168	PO1169	PO1170	PO1171	PO1172	PO1173	PO1174	PO1175	PO1176	PO1177	PO1178	PO1179	PO1180	PO1181	PO1182	PO1183	PO1184	PO1185	PO1186	PO1187	PO1188	PO1189	PO1190	PO1191	PO1192	PO1193	PO1194	PO1195	PO1196	PO1197	PO1198	PO1199	PO1200	PO1201	PO1202	PO1203	PO1204	PO1205	PO1206	PO1207	PO1208	PO1209	PO1210	PO1211	PO1212	PO1213	PO1214	PO1215	PO1216	PO1217	PO1218	PO1219	PO1220	PO1221	PO1222	PO1223	PO1224	PO1225	PO1226	PO1227	PO1228	PO1229	PO1230	PO1231	PO1232	PO1233	PO1234	PO1235	PO1236	PO1237	PO1238	PO1239	PO1240	PO1241	PO1242	PO1243	PO1244	PO1245	PO1246	PO1247	PO1248	PO1249	PO1250	PO1251	PO1252	PO1253	PO1254	PO1255	PO125
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20	PO21	PO22	PO23	PO24	PO25	PO26	PO27	PO28	PO29	PO30	PO31	PO32	PO33	PO34	PO35	PO36	PO37	PO38	PO39	PO40	PO41	PO42	PO43	PO44	PO45	PO46	PO47	PO48	PO49	PO50	PO51	PO52	PO53	PO54	PO55	PO56	PO57	PO58	PO59	PO60	PO61	PO62	PO63	PO64	PO65	PO66	PO67	PO68	PO69	PO70	PO71	PO72	PO73	PO74	PO75	PO76	PO77	PO78	PO79	PO80	PO81	PO82	PO83	PO84	PO85	PO86	PO87	PO88	PO89	PO90	PO91	PO92	PO93	PO94	PO95	PO96	PO97	PO98	PO99	PO100	PO101	PO102	PO103	PO104	PO105	PO106	PO107	PO108	PO109	PO110	PO111	PO112	PO113	PO114	PO115	PO116	PO117	PO118	PO119	PO120	PO121	PO122	PO123	PO124	PO125	PO126	PO127	PO128	PO129	PO130	PO131	PO132	PO133	PO134	PO135	PO136	PO137	PO138	PO139	PO140	PO141	PO142	PO143	PO144	PO145	PO146	PO147	PO148	PO149	PO150	PO151	PO152	PO153	PO154	PO155	PO156	PO157	PO158	PO159	PO160	PO161	PO162	PO163	PO164	PO165	PO166	PO167	PO168	PO169	PO170	PO171	PO172	PO173	PO174	PO175	PO176	PO177	PO178	PO179	PO180	PO181	PO182	PO183	PO184	PO185	PO186	PO187	PO188	PO189	PO190	PO191	PO192	PO193	PO194	PO195	PO196	PO197	PO198	PO199	PO200	PO201	PO202	PO203	PO204	PO205	PO206	PO207	PO208	PO209	PO210	PO211	PO212	PO213	PO214	PO215	PO216	PO217	PO218	PO219	PO220	PO221	PO222	PO223	PO224	PO225	PO226	PO227	PO228	PO229	PO230	PO231	PO232	PO233	PO234	PO235	PO236	PO237	PO238	PO239	PO240	PO241	PO242	PO243	PO244	PO245	PO246	PO247	PO248	PO249	PO250	PO251	PO252	PO253	PO254	PO255	PO256	PO257	PO258	PO259	PO260	PO261	PO262	PO263	PO264	PO265	PO266	PO267	PO268	PO269	PO270	PO271	PO272	PO273	PO274	PO275	PO276	PO277	PO278	PO279	PO280	PO281	PO282	PO283	PO284	PO285	PO286	PO287	PO288	PO289	PO290	PO291	PO292	PO293	PO294	PO295	PO296	PO297	PO298	PO299	PO300	PO301	PO302	PO303	PO304	PO305	PO306	PO307	PO308	PO309	PO310	PO311	PO312	PO313	PO314	PO315	PO316	PO317	PO318	PO319	PO320	PO321	PO322	PO323	PO324	PO325	PO326	PO327	PO328	PO329	PO330	PO331	PO332	PO333	PO334	PO335	PO336	PO337	PO338	PO339	PO340	PO341	PO342	PO343	PO344	PO345	PO346	PO347	PO348	PO349	PO350	PO351	PO352	PO353	PO354	PO355	PO356	PO357	PO358	PO359	PO360	PO361	PO362	PO363	PO364	PO365	PO366	PO367	PO368	PO369	PO370	PO371	PO372	PO373	PO374	PO375	PO376	PO377	PO378	PO379	PO380	PO381	PO382	PO383	PO384	PO385	PO386	PO387	PO388	PO389	PO390	PO391	PO392	PO393	PO394	PO395	PO396	PO397	PO398	PO399	PO400	PO401	PO402	PO403	PO404	PO405	PO406	PO407	PO408	PO409	PO410	PO411	PO412	PO413	PO414	PO415	PO416	PO417	PO418	PO419	PO420	PO421	PO422	PO423	PO424	PO425	PO426	PO427	PO428	PO429	PO430	PO431	PO432	PO433	PO434	PO435	PO436	PO437	PO438	PO439	PO440	PO441	PO442	PO443	PO444	PO445	PO446	PO447	PO448	PO449	PO450	PO451	PO452	PO453	PO454	PO455	PO456	PO457	PO458	PO459	PO460	PO461	PO462	PO463	PO464	PO465	PO466	PO467	PO468	PO469	PO470	PO471	PO472	PO473	PO474	PO475	PO476	PO477	PO478	PO479	PO480	PO481	PO482	PO483	PO484	PO485	PO486	PO487	PO488	PO489	PO490	PO491	PO492	PO493	PO494	PO495	PO496	PO497	PO498	PO499	PO500	PO501	PO502	PO503	PO504	PO505	PO506	PO507	PO508	PO509	PO510	PO511	PO512	PO513	PO514	PO515	PO516	PO517	PO518	PO519	PO520	PO521	PO522	PO523	PO524	PO525	PO526	PO527	PO528	PO529	PO530	PO531	PO532	PO533	PO534	PO535	PO536	PO537	PO538	PO539	PO540	PO541	PO542	PO543	PO544	PO545	PO546	PO547	PO548	PO549	PO550	PO551	PO552	PO553	PO554	PO555	PO556	PO557	PO558	PO559	PO560	PO561	PO562	PO563	PO564	PO565	PO566	PO567	PO568	PO569	PO570	PO571	PO572	PO573	PO574	PO575	PO576	PO577	PO578	PO579	PO580	PO581	PO582	PO583	PO584	PO585	PO586	PO587	PO588	PO589	PO590	PO591	PO592	PO593	PO594	PO595	PO596	PO597	PO598	PO599	PO600	PO601	PO602	PO603	PO604	PO605	PO606	PO607	PO608	PO609	PO610	PO611	PO612	PO613	PO614	PO615	PO616	PO617	PO618	PO619	PO620	PO621	PO622	PO623	PO624	PO625	PO626	PO627	PO628	PO629	PO630	PO631	PO632	PO633	PO634	PO635	PO636	PO637	PO638	PO639	PO640	PO641	PO642	PO643	PO644	PO645	PO646	PO647	PO648	PO649	PO650	PO651	PO652	PO653	PO654	PO655	PO656	PO657	PO658	PO659	PO660	PO661	PO662	PO663	PO664	PO665	PO666	PO667	PO668	PO669	PO670	PO671	PO672	PO673	PO674	PO675	PO676	PO677	PO678	PO679	PO680	PO681	PO682	PO683	PO684	PO685	PO686	PO687	PO688	PO689	PO690	PO691	PO692	PO693	PO694	PO695	PO696	PO697	PO698	PO699	PO700	PO701	PO702	PO703	PO704	PO705	PO706	PO707	PO708	PO709	PO710	PO711	PO712	PO713	PO714	PO715	PO716	PO717	PO718	PO719	PO720	PO721	PO722	PO723	PO724	PO725	PO726	PO727	PO728	PO729	PO730	PO731	PO732	PO733	PO734	PO735	PO736	PO737	PO738	PO739	PO740	PO741	PO742	PO743	PO744	PO745	PO746	PO747	PO748	PO749	PO750	PO751	PO752	PO753	PO754	PO755	PO756	PO757	PO758	PO759	PO760	PO761	PO762	PO763	PO764	PO765	PO766	PO767	PO768	PO769	PO770	PO771	PO772	PO773	PO774	PO775	PO776	PO777	PO778	PO779	PO780	PO781	PO782	PO783	PO784	PO785	PO786	PO787	PO788	PO789	PO790	PO791	PO792	PO793	PO794	PO795	PO796	PO797	PO798	PO799	PO800	PO801	PO802	PO803	PO804	PO805	PO806	PO807	PO808	PO809	PO810	PO811	PO812	PO813	PO814	PO815	PO816	PO817	PO818	PO819	PO820	PO821	PO822	PO823	PO824	PO825	PO826	PO827	PO828	PO829	PO830	PO831	PO832	PO833	PO834	PO835	PO836	PO837	PO838	PO839	PO840	PO841	PO842	PO843	PO844	PO845	PO846	PO847	PO848	PO849	PO850	PO851	PO852	PO853	PO854	PO855	PO856	PO857	PO858	PO859	PO860	PO861	PO862	PO863	PO864	PO865	PO866	PO867	PO868	PO869	PO870	PO871	PO872	PO873	PO874	PO875	PO876	PO877	PO878	PO879	PO880	PO881	PO882	PO883	PO884	PO885	PO886	PO887	PO888	PO889	PO890	PO891	PO892	PO893	PO894	PO895	PO896	PO897	PO898	PO899	PO900	PO901	PO902	PO903	PO904	PO905	PO906	PO907	PO908	PO909	PO910	PO911	PO912	PO913	PO914	PO915	PO916	PO917	PO918	PO919	PO920	PO921	PO922	PO923	PO924	PO925	PO926	PO927	PO928	PO929	PO930	PO931	PO932	PO933	PO934	PO935	PO936	PO937	PO938	PO939	PO940	PO941	PO942	PO943	PO944	PO945	PO946	PO947	PO948	PO949	PO950	PO951	PO952	PO953	PO954	PO955	PO956	PO957	PO958	PO959	PO960	PO961	PO962	PO963	PO964	PO965	PO966	PO967	PO968	PO969	PO970	PO971	PO972	PO973	PO974	PO975	PO976	PO977	PO978	PO979	PO980	PO981	PO982	PO983	PO984	PO985	PO986	PO987	PO988	PO989	PO990	PO991	PO992	PO993	PO994	PO995	PO996	PO997	PO998	PO999	PO1000	PO1001	PO1002	PO1003	PO1004	PO1005	PO1006	PO1007	PO1008	PO1009	PO1010	PO1011	PO1012	PO1013	PO1014	PO1015	PO1016	PO1017	PO1018	PO1019	PO1020	PO1021	PO1022	PO1023	PO1024	PO1025	PO1026	PO1027	PO1028	PO1029	PO1030	PO1031	PO1032	PO1033	PO1034	PO1035	PO1036	PO1037	PO1038	PO1039	PO1040	PO1041	PO1042	PO1043	PO1044	PO1045	PO1046	PO1047	PO1048	PO1049	PO1050	PO1051	PO1052	PO1053	PO1054	PO1055	PO1056	PO1057	PO1058	PO1059	PO1060	PO1061	PO1062	PO1063	PO1064	PO1065	PO1066	PO1067	PO1068	PO1069	PO1070	PO1071	PO1072	PO1073	PO1074	PO1075	PO1076	PO1077	PO1078	PO1079	PO1080	PO1081	PO1082	PO1083	PO1084	PO1085	PO1086	PO1087	PO1088	PO1089	PO1090	PO1091	PO1092	PO1093	PO1094	PO1095	PO1096	PO1097	PO1098	PO1099	PO1100	PO1101	PO1102	PO1103	PO1104	PO1105	PO1106	PO1107	PO1108	PO1109	PO1110	PO1111	PO1112	PO1113	PO1114	PO1115	PO1116	PO1117	PO1118	PO1119	PO1120	PO1121	PO1122	PO1123	PO1124	PO1125	PO1126	PO1127	PO1128	PO1129	PO1130	PO1131	PO1132	PO1133	PO1134	PO1135	PO1136	PO1137	PO1138	PO1139	PO1140	PO1141	PO1142	PO1143	PO1144	PO1145	PO1146	PO1147	PO1148	PO1149	PO1150	PO1151	PO1152	PO1153	PO1154	PO1155	PO1156	PO1157	PO1158	PO1159	PO1160	PO1161	PO1162	PO1163	PO1164	PO1165	PO1166	PO1167	PO1168	PO1169	PO1170	PO1171	PO1172	PO1173	PO1174	PO1175	PO1176	PO1177	PO1178	PO1179	PO1180	PO1181	PO1182	PO1183	PO1184	PO1185	PO1186	PO1187	PO1188	PO1189	PO1190	PO1191	PO1192	PO1193	PO1194	PO1195	PO1196	PO1197	PO1198	PO1199	PO1200	PO1201	PO1202	PO1203	PO1204	PO1205	PO1206	PO1207	PO1208	PO1209	PO1210	PO1211	PO1212	PO1213	PO1214	PO1215	PO1216	PO1217	PO1218	PO1219	PO1220	PO1221	PO1222	PO1223	PO1224	PO1225	PO1226	PO1227	PO1228	PO1229	PO1230	PO1231	PO1232	PO1233	PO1234	PO1235	PO1236	PO1237	PO1238	PO1239	PO1240	PO1241	PO1242	PO1243	PO1244	PO1245	PO1246	PO1247	PO1248	PO1249	PO1250	PO1251	PO1252	PO1253	PO1254	PO1255	PO125	

COURSE NAME: STRUCTURAL ANALYSIS COURSE CODE: CE 402 CONTACT: 4:0:0 TOTAL CONTACT HOURS: 48 HRSCREDITS: 4	
Pre requisites: Students must have knowledge in engineering mechanics, solving of free body diagrams and application of different structural aspects of materials in any type of structures like support reactions, bending moments, stresses, torsion etc.	
Course Objective: To provide knowledge about determinate and indeterminate structures and how to calculate degree of indeterminacy of a structure, applications and analysis of determinate and indeterminate structures in various aspects.	
Course Outcome: CO1. Learn about determinate and indeterminate structures and determination of degree of static and kinematic indeterminacy for any type of structures. CO2. Analysis of any structure by strain energy method. CO3. Analysis of determinate and indeterminate structures by different methods.	
Course contents:	
<u>Module-1:[3L]</u> Determination of stability of any type of structure, Determinate and Indeterminate structures, Degree of indeterminacy for different types of structures: Beams, Frames, Trusses.	3L
<u>Module-2:[6L]</u> Analysis of determinate structures: Portal frames, arches.	6L
<u>Module-3:[6L]</u> <u>Strain energy:</u> Due to axial load, bending and shear, Torsion; Castigliano's theorems, theorem of minimum potential energy, Muller Breslau Principle, principle of virtual work, Maxwell's theorem of reciprocal deflection, Betti's law	6L
<u>Module-4:[6L]</u> <u>Deflection of determinate structures:</u> Moment area and Conjugate beam method, Energy methods, Unit load method for beams, Deflection of trusses and simple portal frames	6L
<u>Module-5:[6L]</u> <u>Influence line diagrams:</u> Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears.	6L
<u>Module-6:[3L]</u> <u>Analysis of statically indeterminate beams:</u> Theorem of three moments, Energy Method, Force Method, Analysis of two hinged arch.	3L
<u>MODULE -7:[6L]</u> <u>Analysis of statically indeterminate structures:</u> Moment distribution method, Slope Deflection Method, Approximate method of analysis of structures-portal and cantilever method.	6L

Text/ReferenceBooks:

Slno	Name	Author	Publishers
1	Engineering Mechanics of Solids	By E.P. Popov	Pearson Education
2	Basic structural Analysis	C.S. Reddy	TMH
3	Statically indeterminate structures	C.K. Wang	McGraw-Hill
4	Structural Analysis (Vol I & Vol II)	SS Bhavikatti	Vikas Publishing House Pvt. Ltd
5	Structural Analysis	Ramamurtham	
6	Structures	Schodek & M. Bechhold	Pearson Education

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16
CO1	3	3	3	2	-	1	2	1	2	3	3	2	2	2	-	-
CO2	3	3	3	3	1	2	1	1	2	1	2	2	2	2	-	-
CO3	3	3	3	2	2	2	1	2	3	3	2	2	2	2	-	-

COURSE NAME: SOIL MECHANICS COURSE CODE: CE 403 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSCREDITS: 3	
Prerequisites: Student should have knowledge about the basic of strength of materials, physics and chemistry	
Course Objective: To provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behavior and methods to determine soil properties. Students will acquire basic knowledge in engineering design of geotechnical systems	
Course Outcome: <p>CO1 Identify the fundamental differences in engineering behavior between cohesive and cohesionless soils</p> <p>CO2 Compute the groundwater seepage and distribution of groundwater pressure.</p> <p>CO3 Calculate the applied stress beneath the ground surface.</p> <p>CO4 Demonstrate that you know the fundamental difference in the strength and deformation characteristics of cohesive and cohesionless soils.</p> <p>CO5 Analyze field and laboratory data to determine the strength and deformation on properties of cohesive and cohesionless soils.</p> <p>CO6 Determine settlements due to consolidation of soil</p>	
Course contents:	
Module-I: [4L+1T] <u>Origin & formation of Soil:-</u> Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy. [2L] <u>Soil as a Three Phase System:-</u> Weight-Volume Relationship, Measurement of Physical Properties of Soil: In situ Density, Moisture Content, Specific Gravity, Relative Density. [2L+1T]	5L
Module-II: [6L+1T] <u>Particle Size Distribution:-</u> By Sieving, Sedimentation Analysis. [2L] <u>Index Properties of Soil:-</u> Atterberg's Limits- Determination of Index Properties of Soil by Casagrande's Apparatus, Cone Penetrometer, Soil Indices. [2L] <u>Soil Classification:-</u> As per Unified Classification System, As per IS Code Recommendation, AASHTO Classification, Field Identification of Soil, Consistency of Soil. [2L+1T]	7L
Module-III: [6L+3T] <u>Soil Moisture :-</u> Darcy's Law, Capillarity in Soil, Permeability, Determination of Coefficient of Permeability of Soil in Laboratory, Permeability for Stratified Deposits. [2L+1T] <u>Effective Stress Principles:-</u> Definition of Effective Stress, Estimation of Effective Pressure Due to different conditions [2L+1T]	9L
Two Dimensional Flow Through Soil :- Laplace's Equations, Flow nets, Flow Through Earthen Dam, estimation of Seepage, Uplift due to Seepage, Design of Fillers, Critical Hydraulic Gradient, Quick Sand condition [2L+1T]	

<p>Module-IV:[4L+2T] Stress Distribution In Soil :- Bousinesqs & Westergaads Assumption & Formula for Determination of stress due to Point Loads, Stress Beneath Line, Strip & Uniformly Loaded Circular - Pressure Bulbs, Newmarks charts- Use For Determination of Stress due to Arbitrarily Loaded Areas, Contact Stress distribution for various types of Loading & on Different Types of Soils. [2L+1T] Compaction of Soil :- Principles of Compaction, IS Light & Heavy Compaction Test, Field Compaction Equipments, Various methods of field Compaction Control. [2L+1T]</p>	6L
<p>Module-V: [6L+3T] Compressibility & Consolidation of Soil: - Terzaghi's Theory of One Dimensional Consolidation, Compressibility Characteristics of Soils, Compression Index, Coefficient of Compressibility & Volume change, Coefficient of Consolidation, Degree & rate of Consolidation, Consolidometer & Laboratory One Dimensional Consolidation Test as per latest IS Code, Determination of Consolidation Parameters, Secondary Consolidation. [4L+2T] Shear Strength of Soil:- Basic Concept of Shear Resistance & Shear Strength of Soil, Mohr- Columb's Theory, Laboratory Determination of Soil Shear Parameter- Direct Shear, Tri-axial Test, Unconfined Compression, Vane Shear Test, Sensitivity & thixotropy of clay. [2L+1T]</p>	9L

Text/Reference Books:

Sl no	Name	Author	Publishers
1	Text book of Soil Mechanics & Foundation Engineering	V.N.S. Murthy	CBS Publisher's & Distributors
2	Principles of Foundation Engineering	B.M. Das	Thomson Book
3	Principles of Geotechnical Engineering	B. M. Das	Thomson Book Store
4	Basic & Applied Soil Mechanics	Gopal Ranjan & A.S.R.Rao	Willes Eastern Ltd
5	Soil Mechanics	Lambe & Whitman	WIE
6	Hand Book of Bureau of Indian Standard IS –1904, 6403, 8009, 2950, 2911 etc		

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	1	1	1	1	2	3	3	3
CO2	2	2	3	3	2	3	1	1	2	2	2	3	2	3	2
CO3	2	2	3	2	2	1	1	3	2	1	1	2	1	1	1
CO4	3	3	3	3	3	2	1	3	2	1	3	3	2	2	2
CO5	2	3	1	2	1	3	1	2	2	2	2	2	2	2	2
CO6	3	3	3	3	2	2	2	2	3	2	2	3	2	2	2

Course Name: Numerical Methods

Course Code: M(CE) 401

Total Contact Hours: 36

Credit: 3

Prerequisite:

The students to whom this course will be offered must have the concept of (10+2) standard number system, algebra and calculus and basic knowledge of numerical analysis.

Course Objectives:

The purpose of this course is to provide better understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic.

Course Outcomes (COs):

On successful completion of the learning sessions of the course, the learner will be able to:

CO	DESCRIPTIONS
CO1	Recall the distinctive principles of numerical analysis and the associated error measures.
CO2	Understand the theoretical workings of numerical techniques.
CO3	Apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as interpolation, the solution of linear and nonlinear equations, and the solution of ordinary and partial differential equations.
CO4	Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources.

Course Content

MODULE I: Error Analysis and Interpolation (10 Lectures)

Approximation in Numerical Computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic.

Interpolation: Central Difference Operator: Stirling's interpolation formula, Bessel's interpolation formula, Cubic Spline interpolation.

MODULE II: Matrix and Numerical Solution of Linear and Non-linear Equations (16 Lectures)

Matrix: Eigen values and eigen vectors of matrix: Power method.

Numerical Solution of a System of Linear Equations: Gauss elimination method, Tridiagonal matrix algorithm, LU Factorization method, Gauss-Jacobi iterative method, Gauss-Seidel iterative method, Successive over Relaxation (SOR) method.

Solution of Polynomial and Transcendental Equations: Bisection method, Regula-Falsi, Secant Method, Newton-Raphson method, fixed point iteration.

MODULE III: Numerical Solution of Differential Equation (10 Lectures)

Numerical Solution of Ordinary Differential Equation: Taylor series method, Adams- Bashforth-Moulton method and Milne's Predictor-Corrector methods, finite difference method.

Numerical solution of partial differential equation: Finite Difference method, Crank-Nicolson method.

Project Domains:

1. Application of PDE and ODE in Engineering Field.
2. Application of numerical methods for the relevant field.
3. Mathematical modelling.

Text Books:

1. Shishir Gupta & S. Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2. C. Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta & Jana: Introductory Numerical Analysis. PHI Learning
4. J. B. Scarborough: Numerical Mathematical Analysis. Oxford and IBH Publishing
5. Jain, M. K., Iyengar, S. R. K. and Jain, R. K. *Numerical Methods (Problems and Solution)*. New age International Publisher.
6. Prasun Nayek: Numerical Analysis, [Asian Books](#)

Reference Books:

1. Balagurusamy, E. *Numerical Methods*, Scitech. TMH.
2. Dutta, N. *Computer Programming & Numerical Analysis*, Universities Press.
3. Guha, S. and Srivastava, R. *Numerical Methods*, Oxford Universities Press.
4. Shastri, S. S. *Numerical Analysis*, PHI.
5. Mollah, S. A. *Numerical Analysis*, New Central Book Agency.
6. Numerical Methods for Mathematics, Science & Engg., Mathews, PHI.
7. Rao, G. S. *Numerical Analysis*, New Age International.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	1	2	2	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	2	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	2	-
CO4	3	3	2	3	-	-	-	-	-	-	-	1	2	2	-

COURSE NAME: CONCRETE TECHNOLOGY LAB**COURSE CODE: CE491****CONTACT: 0:0:3****CREDITS: 1.50****Prerequisites:** Students should have the basic knowledge about concrete technology theory

Course Objective: The objective of this course is to understand the characteristics and behavior of civil engineering materials used in buildings and infrastructure. Students will learn standard principles and procedure to design, prepare and/or test materials such as concrete mix design including field test methods for fresh concrete. Know how to select materials based on their properties and their proper use for a particular facility under prevailing loads and environmental conditions.

Course Outcome:

- CO1 Identify the functional role of ingredients of concrete
 CO2 Apply this knowledge to mix design philosophy to get different grade of concrete
 CO3 Students should be able to test of different concrete property to specify quality of concrete
 CO4 Students shall learn to work in a team to achieve the objective

LIST OF EXPERIMENT:

Test on cement—specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar Cubes.

Test on fine aggregate—specific gravity, bulking

sieve analysis, fineness modulus, moisture content, bulk density, voids and Deleterious materials.

Test on coarse aggregate—specific gravity, sieve analysis, fineness modulus, bulk density and voids.

Test on Fresh Concrete: Workability: Slump, Vee-Bee, Compaction factor tests

Test on Fresh Concrete: Workability: Slump, Vee-Bee, Compaction factor tests

Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure tests, Nondestructive testing (Rebound hammer & Ultrasonic pulse velocity)

Mix Design—As per IS 10262 (2009) method

Text/Reference Books:

SLNO	NAME	Author	publisher
1	Concrete Technology	Neville	Pearson Education
2	Concrete Technology	M.S. Shetty	S. Chand
3	Concrete Technology	R. Santakumar	OXFORD University Press
4	Concrete Technology	M.L. Gambhir	Tata McGraw Hill
5	Textbook of Concrete	P.D. Kulkarni	
	Tata McGraw Hill Technology		

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2	PSO2 3	01
CO1	3	2	2	2	2	-	-	-	1	1	-	1	2	2	-
CO2	3	2	2	2	2	1	1	1	1	-	-	1	2	2	-
CO3	3	2	2	2	2	1	-	-	1	-	-	1	2	2	-
CO4	1	1	1	1	1	-	1	1	3	2	2	1	2	2	-

COURSE NAME: SOIL MECHANICS LAB – ICOURSECODE:CE 492 CONTACT:0:0:3 CREDITS :1.50															
Prerequisites: Students should have the basic knowledge about Basic Soil Mechanics theory															
Course Objective: Provide civil engineering students with the basic knowledge to carry out field investigations and to identify soils in geotechnical engineering practice and educate civil engineering students in performing and interpretation laboratory tests for evaluating soil property.															
Course Outcome: CO1:Identify soils with reference to their characteristics CO2: Describe the behavior and effect of water in soils CO3:Examine modes of soil behavior CO4:Calculate and plot soil strength parameters CO5:Interpret different methods of improving soil stability															
LIST OF EXPERIMENT:															
1. Field identification of different types of soils as per Indian standards [collection of field samples and identifications without laboratory testing], determination of natural moisture content. 2. Determination of specific gravity of i) Cohesionless ii) cohesive soil 3. Determination of In situ density by core cutter method & sand replacement method. 4. Grain size distribution of cohesionless soil by sieving & fine-grained soil by hydrometer analysis. 5. Determination of Atterberg's limits (liquid limit, plastic limit & shrinkage limit). 6. Determination of coefficient of permeability by constant head permeameter (coarse grained soil) & variable head permeameter (fine grained soil). 7. Determination of compaction characteristics of soil.															
Reference 1. Soil Testing by T.W. Lamb (John Wiley) 2. SP-36 (Part-I & Part-II) 3. Measurement of Engineering properties of soil by E. Saibaba Reddy & K. Ramasastri. (New Age International publication).															
CO-PO mapping:															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	3	3	2	1	-	1	3	2	2	3	2	3
CO2	3	3	2	2	3	2	1	1	-	2	3	1	3	3	3
CO3	3	2	1	2	1	3	1	2	-	2	1	2	2	2	3
CO4	2	3	2	3	1	1	2	1	2	1	2	3	2	2	2
CO5	2	3	3	2	2	1	1	1	2	1	2	2	2	2	2

COURSE NAME: QUANTITY SURVEYING, SPECIFICATIONS AND VALUATION COURSE CODE: CE493 CONTACT: 0:0:2 CREDITS : 1.0															
Pre requisites: Students should have knowledge about building construction and material details.															
Course Objective: The objective of this course is to give the students basic knowledge of estimating and valuation of civil engineering works. After completing this course, the students will also be able to analyze the rates and estimate the various construction works.															
Course Outcome: CO1: Student will be able to prepare specification for using materials of construction and its items of works. CO2: Student will be able to illustrate a detailed estimation of material consumption and abstracts for entire construction projects CO3: Student will learn how to analyze the rates for different items of work including labor and material. CO4: Interpret fundamental concepts of valuation CO5: Students will be able to identify various legal issues related to construction.															
LIST OF EXPERIMENT:															
Unit I: Different types of estimates, Concept of items of work, unit of measurement, unit rate of payment. Quantity estimate of a single storied building. Bar bending schedule. Details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities. Quantity estimate of Road, Underground reservoir, Surface drain, Septic tank Unit II: Analysis and schedule of rates for Earthwork, brick flat soling, DPC, PCC and RCC, brickwork, plastering, flooring and Finishing. Unit III: Specification of materials: Brick, cement, fine and coarse aggregates; Specification of works: PCC, RCC, First class brickwork, cement plastering and pointing, white washing, colour washing, distempering, lime punning, painting and varnishing Unit IV: Basic concept of Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, Sinking fund, capitalized value, Year of purchase, depreciation, obsolescence, deferred income, freehold and leasehold property, Mortgage, rent fixation, valuation table.															
Text/Reference Books: B.N.Datta, Costing, Estimation and Valuation, UBSPublication S.C.Rangwala, Estimating & Costing (Civil Engg.), Charotar Publication G.S.Birdie, A text book of Estimating & Costing, Dhanpat Rai & Sons S. C.Rangwala, Valuation of Real properties, Charotar Publication Estimating, Costing, Specification & Valuation in Civil Engineering by M.chakraborty															
CO-PO mapping															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	1	2	1	-	-	-	2	2	2	2	-
CO2	3	3	3	2	-	-	-	-	-	-	1	2	2	2	-
CO3	3	3	3	1	-	-	-	-	-	-	2	2	2	2	-
CO4	3	3	3	2	-	-	-	-	-	-	2	2	2	2	-
CO5	3	3	3	2	1	2	-	-	2	2	2	2	2	2	-

COURSENAME: NUMERICALMETHODSLAB

COURSECODE:CS(CE)491

CONTACT:0:0:3

CREDITS :1.50

Prerequisite: Any introductory course on programming language (example. C/Matlab).

CourseObjective: The purpose of this course is to provide basic programming skills for solving the problems in numerical methods.

CourseOutcome(CO):

On successful completion of the learning session of the course, the learner will be able to:

CODES	DESCRIPTIONS
CO1	Understand the theoretical workings of numerical techniques with the help of C/Matlab
CO2	Execute basic command and scripts in a mathematical programming language
CO3	Apply the programming skill to solve the problems using multiple numerical approaches.
CO4	Analyze if the results are reasonable, and then interpret and clearly communicate the results.

LIST OF EXPERIMENT:

1. Assignment on Newton forward/backward, Lagrange's interpolation.
2. Assignment on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Tridiagonal matrix algorithm, Gauss-Seidel iterations. Successive over Relaxation (SOR) method, LU Factorization method.
4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Secant Method, Newton-Raphson method
5. Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods, Taylor series method and Predictor-Corrector method.
6. Assignments on numerical solution of partial differential equation: Finite Difference method, Crank-Nicolson method.

Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab/Scilab/Labview/Mathematica/NAG (Numerical Algorithms Group)/Python.

CO-PO Mapping:

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 1	PO 2	PO 3
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	1	2	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	2	-
CO4	3	3	2	3	-	-	-	-	-	-	-	1	2	2	-

COURSE NAME: INDUSTRIAL TRAINING

COURSE CODE: CE494

CREDIT: 1

Course contents:

Collective Data from 3rd to 4th Semester (Summer/Winter Training during Semester Break & Internship should be done after 3rd Semester or 4th Semester). All related certificates to be collected by the training/internship coordinator(s).

3 rd Year5 th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE501	Structural Design-I	3	0	0	3	3
2	ENGG	Major	CE502	Foundation Engineering	3	0	0	3	3
3	ENGG	Major	CE503	Highway and Transportation Engineering	3	0	0	3	3
4	ENGG	Major	CE504	Environmental Engineering	3	0	0	3	3
5	ENGG	Minor	CE505	Instrumentation & Sensor Technologies for Civil Engineering Applications	4	0	0	4	4
				E. Surveying & Geomatics					
				Application of IOT in civil engineering					
B.PRACTICAL									
6	ENGG	Major	CE591	Soil Mechanics Lab-II	0	0	3	3	1.5
7	ENGG	Major	CE592	Highway and Transportation Engineering Lab	0	0	3	3	1.5
8	ENGG	Major	CE593	Environmental Engineering Lab	0	0	3	3	1.5
9	PROJECT	Minor	PR591	Minor Project-I	0	0	2	2	1
Totalof Theory,PracticalandMandatoryActivities/Courses								27	21.5

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

COURSE NAME: STRUCTURAL DESIGN – ICOURSE CODE: CE501 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Prerequisites: Students should have knowledge about how to solve analysis of structural problem.	
Course Objective: <ol style="list-style-type: none"> 1. Student will be able to perform analysis and design of reinforced concrete members and connections and be able to identify and interpret the appropriate relevant industry design codes. 2. To become familiar with professional and contemporary issues in the design and construction of reinforced concrete members. 	
Course Outcome: CO1: Exhibit the knowledge of concrete design philosophies, by working and limit state methodology CO2 : Design the structural detail of beam and slab CO3 : Design the structural detail of column. CO4 :: Design the structural detail of foundation CO5: Interpret and use the I.S code specifications	
Course contents:	
Module-I:[1L+1T] Introduction: Principles of design of reinforced concrete members - Working stress and Limit State method of design.	2L
Module-II:[2L+2T] Working stress method of design: Basic concepts and IS code provisions (IS:4562000) for design against bending moment and shear forces - Balanced, under reinforced and over reinforced beam/slab sections; design of singly and doubly reinforced sections.	4L
Module-III:[2L+2T] Limit state method of design: Basic concepts and IS code provisions (IS:4562000) for design against bending moment and shear forces; concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP:16).	4L
Module-IV:[2L+2T] Analysis, design and detailing of singly reinforced rectangular, "T", "L" and doubly reinforced beam sections by limit state method.	4L
Module-V:[2L+2T] Design and detailing of one-way and two-way slab panels as per IS code provisions	4L
Module-VI:[2L+2T] Design and detailing of continuous beams and slabs as per IS code provisions	4L
Module-VII:[2L+2T] Staircases: Types; Design and detailing of reinforced concrete dog-legged staircase	4L
Module-VIII:[2L+2T] Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP16.	4L
Module-IX:[3L+3T] Shallow foundations: Types; Design and detailing of reinforced concrete isolated square and Rectangular footing for columns as per IS code provisions by limit state method.	6L
Limit state method should be followed for serial number 4 to 9 as above as per IS 456 - 2000	

Text/ReferenceBooks:

Name	Author	Publishers
IS: 456- 2000 “Indian Standard for Plain and reinforced concrete – code of practice	Bureau of Indian Standard	
SP:16 Design Aid to IS 456		
Reinforced Concrete Design by	Pillai and Menon	TMH
Reinforced concrete Limit state design	AshokK.Jain,Arun kv jain,B.C.Punmia	Laxmi publication
Reinforced concrete	S.N.Sinha	TMH
Fundamentals of reinforced concrete	N.C.Sinha and S.K. Roy	S.Chand &Co
Limit State Design of Reinforced Concrete	P. C. Varghese	PHI
Reinforced Concrete	S. K. Mallick and A. P. Gupta	Oxford IBH
Reinforced cement Concrete Design	Neelam Sharma	S.K hataria & sons

CO-POmapping

CO	PO	PO2	PO4	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PS	PS	PS	SO1	3	5	0
			1		2						1	2	3				
CO1	3	2	3	3	3	3	2	1	1	2	1	3	1	1	3		
CO2	2	2	2	2	1	3	2	2	2	2	2	2	2	2	2		
CO3	2	2	1	2	3	2	1	3	2	2	2	3	2	2	3		
CO4	2	1	2	2	2	2	3	2	2	2	1	2	2	3	2		
CO5	2	2	2	3	2	2	2	1	1	2	2	2	2	2	3		

COURSE NAME: FOUNDATION ENGINEERING C COURSE CODE: CE502 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Prerequisites: Students should have knowledge about basic of Soil Mechanics	
Course Objective: Application of soil mechanics and other related techniques to design of foundation. Methods and site and soil exploration; bearing capacity and settlements; shallow and deep foundation; bracing and retaining structures. Case studies.	
Course Outcome: CO1: Describe bearing capacity of soil and settlement analysis of soil. CO2: Define earth pressure theories CO3 : Analysis of slope stability CO4: Classify piles & their loading capacity for deep foundation. CO5: Demonstrate the fundamental knowledge of Site investigation and soil exploration	
Course contents:	
Module-1: Earth Pressure Theories: -Plastic equilibrium of soil, Earth pressure at rest, Active & passive Earth pressure, Rankin's & Coulomb's earth pressure theories, wedge method of analysis, estimation of earth pressure by graphical construction (Culmann method).	4L
Module-2: Retaining Wall & sheet pile structures: Proportions of retaining walls, stability checks, cantilever and anchored sheet piles, free earth and fixed earth method of analysis of anchored bulkheads, coffer dam structure types.	8L
Module-3: Stability of slopes: Analysis of finite and infinite slopes, Swedish and friction circle method, Taylor's stability number, Bishop's method of stability analysis.	4L
Module-4: Site Investigation & Soil Exploration: Planning of sub-surface exploration, methods, sampling, samples, In situ tests: SPT, SCPT, DCPT, field vane shear, Plate load test.	4L
Module-5: Shallow foundations: Safe bearing capacity, Terzaghi's bearing capacity theory, effect of depth of embedment, water table, eccentricity of load, foundation shape on bearing capacity, Bearing capacity as per IS 6403	4L
Module-6: Settlement analysis of shallow foundation: Immediate and consolidation settlement, correction for rigidity and dimension effects, settlement in various types of soil, IS-1904 and 8009 recommendations, Allowable bearing capacity	4L

Module-7:**8L**

Deep foundations: Pile: Types, load transfer mechanism Determination of load carrying capacities of piles by static and dynamic formulae, Recommendations of IS 2911, Pile group: Group efficiency, Negative skin friction, pile load test.

Text/Reference Books:

Name	Author	Publishers
Principles of Geotechnical Engineering	B. M. Das	Thomson Book Store
Text book of Soil Mechanics & Foundation Engineering	V.N.S. Murthy	CBS Publisher's & Distributors
Geotechnical Engineering – Principles and Practice	Coduto	Pearson Education
Soil Mechanics	Lambe & Whitman	WIE
Basic & Applied Soil Mechanics	Gopal Ranjan & A.S.R. Rao	Wiley Eastern Ltd
SP 36 (Part I) Numerical Problems – Geotechnical Engineering	Rao & Venkatramaiah	University Press

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	2	2	2	1	1	1	2	3	1	2	3	3	2	3
CO2	2	2	2	3	2	2	1	2	3	1	2	3	3	2	3
CO3	2	2	1	2	1	1	1	1	2	1	1	2	2	2	3
CO4	2	1	1	2	3	2	1	1	2	1	2	2	2	2	2
CO5	3	2	3	2	2	2	2	2	3	2	3	3	3	3	3

COURSE NAME: HIGHWAY AND TRANSPORTATION ENGINEERING COURSE CODE: CE503 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Prerequisites: Knowledge on IRC codes, Loading pattern based on IRC, Traffic features etc.	
Course Objective: Introduction of IRC loading Introduction of Traffic Engineering. Utility of study of traffic management. Basic concept of Railway track, railway governing body and engineering fundamentals.	
Course Outcome: CO1: Understanding of traffic loading pattern CO2: Understanding of traffic engineering and traffic management CO3: Basic concept of railway engineering CO4: Understanding of Loading Pattern of Bridge CO5: Knowledge about IRC Guidelines	
Course contents:	
Module-I: INTRODUCTION OF DIFFERENT TYPES OF LOADING FOR BRIDGE DESIGN BASED ON IRC GUIDELINES: Definition and Basic Forms, Component of bridge, classification of bridge, short history of bridge development. I.R.C Loads. Analysis of IRC Loads, Impact factors, other loads to be considered, Importance of Hydraulic factors in Bridge Design.	6L
Module-II: TRAFFIC ENGINEERING: Traffic Engineering : Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections – Basic traffic conflicts, classification of at-grade intersections, channelization, rotaries, traffic signals, signs and marking; Road Safety; Traffic System Management.	10L
Module-III: TRANSPORTATION MANAGEMENT: Functions of IRC, Central Road Research Institute. Motor Vehicle Act, Jayakar committee Recommendations, Saturation system, Population unit and productivity units. Highway cost analysis, Transportation Demand Analysis, Preparation of Project Report.	6L

Module-IV:**INTRODUCTION OF RAILWAY ENGINEERING:**

Basic Terminologies of Railway Engineering, Different types of Railway planning, Classification of Indian Railways, Classification of Indian Railways based on speed criteria, Undertakings Under Ministry of Railways, Initiatives By Indian Railways For Development Of Tourism Sector, Global Trains Of Tomorrow, Construction And Renewal Of Track, Development of High And Super High Speeds, Modernization Of Track For High Speeds, Administration Of Indian Railways, Railway Expenses, Rates and Fares.

14L**Text/Reference Books:**

Name	Author	Publisher
Highway Engineering	Khanna & Justo	Nemchand & Brothers, Roorkee
Principles of Transportation Engineering	P.Chakroborty & A Das	PHI
IS Specifications on Concrete Aggregate & Bitumen	Bureau of Indian Standard	-
Relevant Latest IRC Codes (IRC-37-2001, IRC 58-2002, IRC 73 – 1980, IRC 86 – 1983, IRC 106 – 1990, IRC 64 – 1990, IRC 15 – 2002 Indian Road Congress	-	-

CO-PO mapping

CO	PO	PO2	PO5	PO4	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16
CO1	3	3	3	2	3	1	1	1	3	3	3	3	3	3	3
CO2	3	3	3	2	2	2	1	1	3	2	3	2	3	2	3
CO3	3	1	2	1	2	3	2	2	1	3	3	3	3	3	3
CO4	3	2	2	1	2	3	2	3	2	3	3	3	2	3	2
CO5	3	2	2	3	3	3	3	3	3	2	3	3	3	3	3

COURSE NAME: ENVIRONMENTAL ENGINEERING COURSE CODE:CE504 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRS CREDITS : 3	
Pre requisites: The basic concept of hydraulics with knowledge of pressure, loss etc calculation. Fundamentals of chemistry and preliminary knowledge of Quantity estimation.	
Course Objective: Students will gain knowledge on water demand and source of water they will acquire knowledge on water quality and its parameters. To be familiar with water distribution Network and water treatment procedures and methodology. Students will be familiar with sewage and Drainage and will be able to design sewer. Students will be acquainted with wastewater characteristics, pollution and wastewater treatment.	
Course Outcome: CO1 : Students will be able to understand key current environmental problems like level of pollution CO2 : Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil. CO3 : Be able to analyze an industrial activity and identify the environmental problems. CO4 : Be able to plan strategies to control, reduce and monitor pollution. CO5 : Be able to select the most appropriate technique to purify and/or control the emission of pollutants. CO6 : Be able to apply the basis of an Environmental Management System (EMS) to an industrial activity	
Course contents:	
Module - 1. Water demands: -Water demands; Per capita demand; Variations in demand; Factors affecting demand; Design period; Population forecasting	3L
Module - 2. Sources of water: Surface water sources; ground water sources.	3L
Module - 3. Water Quality: Impurities in water; Water quality parameters; Standards for potable water.	3L
Module-4. Conveyance of water: Hydraulic design of pressure pipes	3L
Module -5. Water Treatment: Typical flow chart for surface and ground water treatments; Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration, Disinfection.	6L
Module -6. Water Distribution: Analysis of distribution network; Storage and distribution reservoirs; Capacity of reservoirs.	6L
Module – 7. Sewage and Drainage: Definition of Common Terms, Quantity estimation for sanitary sewage and storm sewage.	3L
Module – 8. Sewer Design: Hydraulic design of sewers, Partial flow diagrams and Nomograms	3L

Module – 9. Wastewater Characteristics & Water pollution: Physical, chemical and biological characteristics, DO, BODand COD, pollution characteristics of typical industries, suggested treatment	3L
Module–10.WastewaterTreatment: Typicalflowchartforwastewatertreatment;Primary Treatments;SecondaryTreatments:ActivatedSludgeProcess,TricklingFilterProcess,Septic	3L

Tank.

Text / Reference Books:

Slno	Name	Author	Publishers
1	EnvironmentalEngineering	S.K .Garg,	Khanna Publishers
2	Water Supply, WasteDisposal and EnvironmentalPollution Engineering	A.K.Chatterjee	Khanna Publishers.
3	EnvironmentalEngineering, Vol.II	P. N. Modi	-
4	EnvironmentalModelling	Rajagopalan	Oxford University Press.
5	EnvironmentalEngineering	P. V. Rowe	TMH

CO-PO mapping

CO	PO 1	PO2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	1	2	3	1	1	3	3	3	1	1	1	2	1	2	3
CO2	2	2	3	2	1	3	3	2	1	1	1	2	1	2	3
CO3	3	3	3	3	2	2	3	2	3	3	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	3	2	3	2	3	3	2
CO5	3	3	3	3	3	1	3	2	2	3	3	1	3	3	3
CO6	3	3	3	2	3	3	2	1	2	3	3	1	3	3	2

COURSE NAME: INSTRUMENTATION & SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS COURSECODE: CE505A CONTACT:4:0:0 TOTALCONTACTHOURS:48HRS CREDITS: 4	
Prerequisites: Knowledge on practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems.	
CourseObjective: The objective of this Course is to understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making.	
CourseOutcome: CO1: To analyze the errors during measurements CO2: To specify the requirements in the calibration of sensors and instruments and describe the noise added during measurements and transmission CO3: To describe the measurement of electrical variables and describe the requirements during the transmission of measured signals CO4: To construct Instrumentation/Computer Networks and suggest proper sensor technologies for specific applications CO5: To design and set up measurement systems and do the studies	
Coursecontents:	
Module-I: Fundamentals of Measurement, Sensing and Instrumentation covering definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations;	12L
Module-II: Sensor Installation and Operation covering to: i) Predict the response of sensors to various inputs; ii) Construct a conceptual instrumentation and monitoring program; iii) Describe the order and methodology for sensor installation; and iv) Differentiate between types of sensors and their modes of operation and measurement and v) Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty	12L
Module-III: Data Analysis and Interpretation covering a) Fundamental statistical concepts, b) Data reduction and interpretation, c) Piezometer, Inclinator, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range)	12L
Module-IV: Frequency Domain Signal Processing and Analysis covering Explain the need for frequency domain analysis and its principles; Draw conclusions about physical processes based on analysis of sensor data; Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution Tutorials from the above modules demonstrating clearly the understanding and use for the sensors and instruments used for the problems posed and inferences drawn from the measurement and observations made along with evaluation report	12L

Text/ReferenceBooks:		
Name	Author	Publishers
Measurement and Instrumentation Principles	Alan S Morris (2001)	3rd/e, Butterworth Hienemann
Electronic Instrumentation and Measurements	David A. Bell (2007),	2nd/e, Oxford Press
Principle of Electrical Measurement	S. Tumanski (2006),	Taylor & Francis
Measurement Theory for Engineers	Ilya Gertsbakh (2010),	Springer

CO-POmapping:															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	3	3	2	1	2	2	1	2	2	2
CO2	3	3	3	3	2	1	3	3	3	2	1	2	2	2	2
CO3	3	3	3	3	2	2	3	3	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	1	3	2	3	3	3	3	3
CO5	2	2	3	3	1	2	3	1	3	1	3	1	3	2	1

COURSE: SURVEYING & GEOMATICS COURSECODE: CE505B CONTACT:4:0:0 TOTALCONTACTHOURS:48HRS CREDITS: 4	
Prerequisites: Knowledge on practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems.	
CourseObjective: The objective of this Course is to understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making.	
CourseOutcome: CO1: Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations. CO2: Calculate, design and layout horizontal and vertical curves. CO3: Operate a total station and GPS to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system. CO4: Relate and apply principles of photogrammetry for surveying. CO5: Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.	
Coursecontents:	
Module-I: Introduction to Surveying: Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and its methods, Meridians and Bearings, Methods of leveling, Booking and reducing levels, Reciprocal leveling, distance of visible horizon, Profile leveling and cross sectioning, Errors in leveling; Introduction to methods of plane table surveying; Contouring: Characteristics, methods, uses, computation of areas and volumes. Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Methods of horizontal and vertical control, Triangulation: Figures or systems, Signals, Satellite station, Baseline and its importance, corrections, Trigonometric leveling: Accessible and inaccessible objects.	12L
Module-II: Curves: Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves- types, characteristics and equations of various transition curves; Introduction to vertical curves.	8L
Module-III: Modern Field Survey Systems: Principle and types of Electronic Distance Measurement systems and instruments, Total Station- its advantages and applications; Global Positioning Systems Segments, working principle, errors and biases. Geographic Information System: Concepts and data types, data models, data acquisition. GIS applications in civil engineering	8L
Module-IV: Photogrammetric Survey: basic principles, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope and stereoscopic views, parallax equations. Introduction to digital photogrammetry.	8L
Module- V: Remote Sensing: Concepts and physical basis of Remote Sensing, Electromagnetic spectrum, atmospheric effects, image characteristics. Remote sensing systems, spectral signatures and characteristics spectral reflectance curves. Salient features of some of Remote Sensing satellites missions. Digital image processing: Introduction, image rectification and restoration, image enhancement, image transformation, image classification. Applications of remote sensing to civil engineering.	12L

Text/ReferenceBooks:		
Name	Author	Publishers
Advanced Surveying: Total Station, GIS and Remote Sensing	Madhu, N, Sathikumar, R and Satheesh Gobi	Pearson India, 2006.
Geomatics Engineering	Manoj, K. Arora and Badjatia,	Nem Chand & Bros, 2011
Surveying and Levelling, Vol. I and II	Bhavikatti, S.S.	I.K. International, 2010
Higher Surveying	Chandra, A.M.,	Third Edition, New Age International (P) Limited, 2002.
Remote sensing and Geographical information system	Anji Reddy, M.	B.S. Publications, 2001.
Surveying, Vol-I, II and III	Arora, K.R.	Standard Book House.
Surveying Vol. I, II,	Punmia BC et al	Laxmi Publication
Remote Sensing and Geographical Information System,	Chandra AM and Ghosh SK	Alpha Science
Remote Sensing & Image Interpretation	Lillesand T M et al	John Wiley & Sons

CO-POmapping:															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	3	3	2	1	2	2	1	2	2	2
CO2	3	3	3	3	2	1	3	3	3	2	1	2	2	2	2
CO3	3	3	3	3	2	2	3	3	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	1	3	2	3	3	3	3	3
CO5	2	2	3	3	1	2	3	1	3	1	3	1	3	2	1

COURSE: APPLICATION OF IOT IN CIVIL ENGINEERING**COURSECODE: CE505C****CONTACT:4:0:0****TOTALCONTACTHOURS:48HRS****CREDITS: 4**

Prerequisite: Operating System, Wireless Sensor Networks, Computer Networks, Cryptography, Communication Technology, Python Programming Language, and Cloud computing.

CourseObjective:

To understand the fundamentals of Internet of Things.

To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.

To apply the concept of Internet of Things in the real world scenario.

CourseOutcomes:

Upon completion of this course, students will acquire knowledge about:

CO-1 - Design a portable IoT using Arduino/ equivalent boards and relevant protocols.

CO-2 - Develop web services to access/control IoT devices.

CO-3 - Deploy an IoT application and connect to the cloud.

CO-4 - Analyze applications of IoT in real time scenario.

Module – 1: Wireless Sensor Network [6L]

Network and Communication aspects, Wireless medium access issues, MAC protocol, Routing protocols, Sensor deployment and Node discovery, Data aggregation and dissemination, Topology, Connectivity, Single-hop and Multi-hop communications.

Module - 2: Fundamental of IoT [6L]

The Internet of Things, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Design challenges, Development challenges, Security challenges, Other challenges.

Module – 3: IoT and M2M [6L]

Main design principles and needed capabilities, IoT architecture outline, standards , M2M and IoT Technology Fundamentals, Devices and gateways, Local and wide area networking, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT Architectural Overview, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

Module – 4: IoT Architecture [6L]

Introduction, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Module – 5: IoT Privacy, Security and Governance [8L]

Introduction, Overview of Governance, Privacy and Security Issues, Access Control, Authentication and Authorization, Distributed trust in IoT, Secure Platform design, Smart

Approach. Data Aggregation for the IoT in smart cities, Intrusion detection and prevention, Security attacks and functional threats.

Module – 6: IoT Layers Architecture [8L]

PHY/MAC Layer - 3GPP MTC, IEEE 802.11, IEEE 802.15, Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7; Network Layer - IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL; Transport Layer - TCP, UDP, TLS, DTLS; Session Layer - HTTP, CoAP, XMPP; Service Layer - oneM2M, ETSI M2M.

Module – 7: IoT Applications for Value Creations [8L]

Introduction, IoT applications for core industry: Future Factory Concepts, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Big Data and Serialization, IoT for Retailing Industry, Oil and Gas Industry, Real-time monitoring and control of processes - Deploying smart machines, smart sensors, and smart controllers with proprietary communication and Internet technologies, Remote control operation of energy consuming devices.

Text/ReferenceBooks:

1. ArshdeepBahga, Vijay Madiseti, “Internet of Things – A Hands-on Approach”, Universities Press, 2015.
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
3. Marco Schwartz, “Internet of Things with the Arduino Yun”, Pack Publishing, 2014.
4. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, McGraw Hill, 2013.
5. CharalamposDoukas,”Building Internet of Things With the Arduino”, Second Edition, 2012.
6. Dr.John Bates, “Thingalytics: Smart Big Data Analytics for the Internet of Things”, Software AG Publisher, 2015.

CO-POmapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	3	3	2	1	2	2	1	2	2	2
CO2	3	3	3	3	2	1	3	3	3	2	1	2	2	2	2
CO3	3	3	3	3	2	2	3	3	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	1	3	2	3	3	3	3	3

COURSE NAME: SOIL MECHANICS LAB-II
COURSE CODE: CE591
CONTACT: 0:0:3
CREDITS: 1.50

Prerequisites: Basic course on soil mechanics with understanding of soil parameters, behavior and response against loading.

Course Objective:

Students will be able to access unconfined compressive strength of soil, shear parameter of soil by direct shear test and undrained shear strength by vane shear test.
 Students will be familiar with fractional test standard penetration test.

Course Outcome:

CO1: Ability to calculate the compressive strength of soil
 CO2: Ability to determine shear strength of soil
 CO3: Ability to understand standard penetration test
 CO4: Ability to understand consolidation parameters of soil
 CO5: Ability to perform all the test for determining shear strength of soil

LIST OF EXPERIMENT:

1. Determination of compressibility characteristics of soil by Oedometer test (co-efficient of consolidation & compression Index)
2. Determination of unconfined compressive strength of soil
3. Determination of Shear parameter of soil by Direct shear test
4. Determination of undrained shear strength of soil by Vane shear test.
5. Determination of shear parameter of soil by Triaxial test (UU)
6. Standard Penetration Test
7. Expt No. 6 by large groups in the field.

Text/Reference Books:

Soil testing by T.W. Lamb (John Wiley) SP-36 (Part-I & Part-II)
 Soil Mechanics Laboratory Manual by B. M. Das, OXFORD UNIVERSITY PRESS
 Measurement of engineering properties of soil by E. Jaibaba Reddy & K. Ramasastri.

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	2	1	2	2	2	1	2	3	3	2	3
CO2	3	3	2	2	2	1	2	2	2	2	2	3	3	2	3
CO3	2	2	1	1	2	2	2	3	2	2	2	3	2	2	3
CO4	3	3	3	2	3	2	3	2	2	2	3	3	2	2	3
CO5	3	3	2	2	2	2	3	2	2	2	3	3	2	2	3

COURSENAME:HIGHWAY& TRANSPORTATION ENGINEERING LAB
COURSECODE: CE592
CONTACT:0:0:3
CREDITS:1.50

Prerequisites: Student should have the basic knowledge about Highway & Transportation engineering.

Course Objective: The objective of this course is to understand the characteristics and behavior of highway materials used in highway engineering. Students will learn standard principles and procedure to design, prepare and/or test materials such as B.M. & S.D.B.C. mix design including Marshal Stability Test. Know how to select materials based on their properties and their proper use for a particular facility under prevailing loads and environmental conditions.

Course Outcome:

CO1: Identify the functional role of different materials of highway engineering.

CO2: Apply this knowledge to mix design philosophy to get different suitable B.M. & S.D.B.C. Mix.

CO3: Students should be able to test of existing highway and examine the quality of that highway by Benkelman Beam Test.

CO4: Student shall learn to work in a team to achieve the objective.

LIST OF EXPERIMENT:

1. **Tests on highway materials** – Aggregates – Impact value, Los Angeles Abrasion value, water absorption, Elongation & Flakiness Index.
2. **Bitumen & bituminous materials** – Specific Gravity, Penetration Value, Ductility, Softening Point, Loss on Heating, Flash & Fire Point Test.
3. **Stripping value test**
4. **Design of mix gradation** for mix sealsurfacing Design of B.M. & S.D.B.C. Mix
5. **Marshal Stability Test.**
6. **Benkelman Beam Test.**

Text/Reference Books:

Highway material testing (Laboratory Manual) by S.K. Khanna and CE.G.

Justo Relevant IS & I.R.C. codes.

BIS codes on Aggregates & Bituminous materials

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	2	1	-	1	1	3	3	2	2
CO2	3	3	3	3	2	2	2	1	1	2	1	3	3	3	2
CO3	3	3	3	3	3	2	2	2	1	3	2	3	2	3	3
CO4	-	3	3	3	2	2	2	3	3	3	3	3	1	3	3

COURSE NAME: ENVIRONMENTAL ENGINEERING LAB C

COURSE CODE: CE593

CONTACT: 0:0:3

CREDITS: 1.50

Pre requisites: Basic course of environmental engineering with preliminary knowledge of chemistry. Knowledge of different impurities and different dissolved solids with chemical behavior of that element.

Course Objective: Students will gain hands on knowledge on different test of water like total solids, turbidity, chloride, carbonate, hardness, fluoride, Iron, residual chlorine demand, BOD, COD, DO, organic matter, nitrate, phosphate and bacteriological quantity of water.

Course Outcome:

CO1: To enumerate various economic, financial, social and sustainable tools in infrastructure management.

CO2: Identify appropriate test for environmental

problems CO3: Statistically analyze and interpret laboratory results

CO4: Apply the

laboratory results to problem identification, quantification, and basic environmental design and technical solutions.

CO5: Understand and use of water and wastewater sampling procedures and sample preservations.

LIST OF EXPERIMENT:

EXPERIMENT NO.	EXPERIMENT NAME	TYPE OF TEST
1.	Determination of turbidity for a given sample of water	PHYSICAL
2.	Determination of solids in a given sample of water: Total Solids, Suspended Solids and Dissolved Solids	
3.	Determination of pH for a given sample of water	
4.	Determination of concentration of Chlorides in a given sample of water	CHEMICAL
5.	Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water	
6.	Determination of hardness for a given sample of water	
7.	Determination of concentration of Fluorides in a given sample of water	
8.	Determination of concentration of Iron in a given sample of water	
9.	Determination of the Optimum Alum Dose for a given sample of water through Jar Test	

10.	Determination of the Residual Chlorine in a given sample of water	
11.	Determination of the Chlorine Demand for a given sample of water	
12.	Determination of the Available Chlorine Percentage in a given sample of bleaching powder	
13.	Determination of amount of Dissolved Oxygen (DO) in a given sample of water	
14.	Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater	
15.	Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater	
16.	Determination of Organic matter/Organic Carbon for a given sample of water	
17.	Determination of Phosphate for a given sample of water	
18.	Determination of Nitrate for a given sample of water	
19.	Determination of Sulphate for a given sample of water	
20.	Determination of bacteriological quality of water: presumptive test, confirmative test and Determination of MPN	BACTERIOLOGICAL

Text/Reference Books:

Name	Author	Publishers
1. Environmental Engineering. Volume-1 and Volume-2.2.	Garg, S.K.	Khanna Publishers
Environmental Engineering.	Peavy, H.S, Rowe, D.R, Tchobanoglous, G	McGraw Hill International Edition/Tata McGraw Hill Indian Edition

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3	3	3	2	1	2	2	1	2	2	2
CO2	3	3	3	3	2	1	3	3	3	2	1	2	2	2	2
CO3	3	3	3	3	2	2	3	3	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	1	3	2	3	3	3	3	3
CO5	2	2	3	3	1	2	3	1	3	1	3	1	3	2	1

COURSE NAME: MINOR PROJECT I

COURSECODE:PR591

CONTACTHOUR:0:0:2

CREDITS:1

Prerequisite:Fundamentals of Civil Engineering.

CourseContents:

- i) literature review on topic of interest.
- ii) Finding research Gaps
- iii) Attempt to solve problems towards filling the research gaps.

3 rd Year6 th Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE601	Structural Design-II	3	0	0	3	3
2	ENGG	Major	CE602	Construction Planning and Management	3	0	0	3	3
3	ENGG	Major	CE603	Irrigation and Water Resource Engineering	4	0	0	4	4
4	SCI	Minor	CE604	A. Operations Research	4	0	0	4	4
				B. Human Resource Management					
				C. Studies On Six Sigma					
B.PRACTICAL									
5	ENGG	Major	CE691	Structural Design and Detailing Lab	0	0	3	3	1.5
6	ENGG	Major	CE692	Computer Aided Design and Drafting Lab	0	0	2	2	1.0
7	ENGG	Internship	CE693	Industrial Training (Min 2 weeks)	0	0	2	2	1.0
8	PROJECT	Minor	PR691	Minor Project-II	0	0	2	2	1.0
Total of Theory,Practical and Mandatory Activities/Courses								23	18.5

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

COURSE NAME: STRUCTURAL DESIGN – II COURSE CODE: CE 601 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRS CREDITS : 3	
Pre requisites: A basic concept of material properties and behavior with basic knowledge of structural analysis and structural elements behavior under different loading pattern. Knowledge of stress and strain with fundamental concept of Engineering mechanics.	
Course Objective: Students will be able to analyse the behaviour of steel structure under different type of loading. To design a connection using IS:800-2007 and satisfy the serviceability and strength parameters. To acquire the knowledge to design tension, compression, members columns, beams. Using the codal Stipulation and basic knowledge of structural analysis students will be able to design plate girders and gentry girders considering lateral buckling.	
Course Outcome: CO1 : Understand various types of design methodology as per limit and working stress method CO2: Interpret different type of connections CO3 : Design compression, tension and beam members CO4 : Analyze column bases CO5 : Design plate girder, uses of stiffeners	
Course contents:	
Module-I: Materials and Specification:- Rolled steel section, types of structural steel, specifications, Residual stress	2L
Module-II: Structure connections: Riveted, welded and bolted including High strength friction grip bolted joints– types of riveted & bolted joints, assumptions, failure of joints, efficiency of joints, and design of bolted riveted, fillet and butt welded joints for axial load, IS code provisions. Eccentric connection:- Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.	6L
Module-III: Tension members: Design of tension members, I.S code provisions. Permissible stresses, Design rules, Examples	4L
Module-IV: Compression members: Effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Design of one component, two components and built up compression members under axial load, Examples. Built up columns under eccentric loading: Design of lacing and batten plates, Different types of Column Bases- Slab Base, Gusseted Base, and Connection details.	6L
Module-V: Beams: Permissible stresses in bending, compression and tension, lateral buckling. Design of rolled steel sections, plated beams. Simple Beam end connections, beam -Column connections. I.S code provisions	6L
Module-VI: Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded & bolted. I.S code provisions	6L

Module-VII: Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions. IS 800 – 2007 to be followed for all IS code provisions.	6L
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Text / Reference Books:

Name	Author	Publishers
Design Of Steel Structures	S.K.Duggal	Tata Mc-Graw Hill , New Delhi
Design of Steel structures	N. Subramanian	Oxford University Press
Design of steel structures	A.S.Arya and J.L.Ajmani	Nemchand& Bros.
Design of steel structures	Vol. I & II Ramachandra	
Design of steel structures	PasalaDayaratnam	A.H.Wheeler& Co Ltd. 1990
Design of steel structures	B.S.Krishnamachar and D.AjithaSinha	Tata McGraw – Hill publishing Co. Delhi.
Design of steel structures	Ramamurtham	
IS 800 – 2007(Latest Revised code) Bureau of Indian Standard		
S.P.: 6(1) – 1964 Structural Steel Sections Bureau of Indian Standard		

CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	1	2	1	2	1	1	2
CO2	2	2	3	3	1	3	2	2	2	2	2	2	2	2	3
CO3	2	2	1	3	3	3	1	2	2	2	2	2	2	2	3
CO4	2	1	2	3	2	2	2	2	2	2	1	2	2	2	3
CO5	2	2	2	3	2	2	2	1	1	2	2	2	2	2	3

COURSE NAME: CONSTRUCTION PLANNING AND MANAGEMENT COURSE CODE: CE 602 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRS CREDITS : 3	
Pre requisites: Basic course in construction material and methodology with understanding of structural elements and their uses and sequence of construction, erection. Basic knowledge of quantity Estimation and valuation.	
Course Objective: Students will gain knowledge on planning, Regulation and by laws for construction. students will be familiar with fire protection, construction plant and equipments. students will be able to plan and schedule construction project by CPM and CEAT. some knowledge on management and departmental procedures of PWD, EMD and SD and familiarity Cost Analysis, project cost, cost slopes and time optimization.	
Course Outcome: CO1 : Students will be able to successfully apply business and Management skills in positions within the construction industry. CO2: Use industry resources including associations and organizations. CO3 : Practice informed decision- making in personal and professional endeavors. CO4 : Manage a quality construction project from start to completion while maintaining budget, schedule, and safety requirements.	
Course contents:	
Module-I: Planning: General consideration, Definition of aspect, prospect, roominess, grouping, circulation Privacy, acclusion	4L
Module-II: Regulation and Bye laws: Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks, ventilation, Requirements for stairs, lifts in public assembly building, offices	4L
Module-III: Fire Protection: Fire fighting arrangements in public assembly buildings, planning, offices, auditorium	4L
Module-IV: Construction plants & Equipment: Plants & equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants & Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control	6L
Module-V: Planning & scheduling of constructions Projects: Planning by CPM & PERT, Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time, probability of completion of project, Estimation of critical path, problems	6L
Module-VI: Management: Professional practice, Definition, Rights and responsibilities of owner,	6L

engineer, Contractors, types of contract															
Module-VII: Departmental Procedures: Administration, Technical and financial sanction, operation of PWD, EMD and SD, Acceptance of tenders, Arbitration, cost Analysis, Direct and Indirect project costs, Total costs- cost slopes. Crushing cost and time optimization															6L
Text / Reference Books:															
Name							Author					Publishers			
Construction Planning, Equipments and methods							Puerifoy					R.L. McGraw Hill			
Management in construction industry							P.P.Dharwadkar					Oxford and IBH Publishing company New Delhi			
Construction Management, Critical path Methods in Construction							J.O.Brien					Wiley Interscience			
PERT and CPM							L.S. Srinath					-			
Project planning and control with PERT and CPM’ Construction equipments and its management							B.C.Punmia and K.K.Kandelwal					S.C.Sharma			
National Building code BIS							-					-			

CO-PO mapping															
	PO 1	P O 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	2	2	2	2	2	-	-	-	-	-	-	2	2	-
CO2	2	2	2	2	1	2	2	-	2	2	2	-	2	2	-
CO3	2	2	1	2	3	2	2	-	2	1	1	-	2	2	-
CO4	-	-	1	1	1	-	-	-	2	1	3	-	2	2	-

COURSENAME: IRRIGATION AND WATERRESOURCEENGINEERING**COURSECODE:CE603****CONTACT:4:0:0****TOTALCONTACTHOURS:48HRSC****REDITS: 4****Prerequisite:** Introduction to Fluid Mechanics in Civil Engineering.**CourseOutcome:**

CO1.TheStudentshould Understandthefundamentals

offlowinopenchannels.CO2.TheStudentswilllearntheconceptsofirrigation.

CO3. The student should understand estimating the different water requirement of different types of cropsCO4.Thestudentshouldlearnthedesignofirrigationchannels soilconservation,flood

watermanagementprojects. controlandother

CO5.TheStudent shouldunderstandabout groundwaterresources,aquifersandwells.

Course Objectives: Students will gain knowledge on the hydrologic cycle, rainfall Calculation and measurement and frequency analysis of rainfall intensity curve. students will also be familiar with direct and indirect method of stream flow measurement to acquire the basic engineering technique of calculating hydrograph S curve flood routing. students will gain knowledge on irrigation methods duty, delta and crop seasons. To acquire knowledge on Canal irrigation and design of Alluvial channel by silt theories Kennedy's method, Lacey's theory.

Familiarity with water logging and Drainage with basic knowledge on groundwater flow, Darcy's law, well, tube well.

CourseContents**Module1**

History of hydrology, Measurement of Rainfall, Rain gauges, Estimation of missing Rainfall data, Checking of consistency, Optimum number of Rain gauges. Calculation of average rainfall over area - different methods, Frequency analysis of rainfall intensity duration curve, depth-area-duration relationship, maximum intensity/depth-duration-frequency relationship, Probable maximum precipitation, Rainfall mass curve, Hyetograph, Examples.

6L**Module2**

Evaporation, evapotranspiration and infiltration: Process, evaporimeters, evaporation equations, methods for reduce evaporation losses, measurement of evapotranspiration, evapotranspiration equation, Potential Evapotranspiration (PET), Actual evapotranspiration (AET), Blaney-Criddle method, Modified Penman's method, Forms of subsurface water, aquifer properties, geological formation of aquifers, Well hydraulics: steady state flow in wells, equilibrium equation for confined and unconfined aquifers, aquifer tests, measurement of drawdown. Examples.

8L**Module 3**

Stream-Flow measurement: Direct and indirect methods, Examples, Stage discharge relationship, SCS-CN method of estimating run-off volume, run-off hydrograph, Factors affecting runoff hydrograph, components of hydrograph, Factors affecting run-off, estimation of run-off, rainfall-runoff relationship, Examples.

4L**Module4**

Types of Irrigation system and their detail description, Crops and crop seasons in India, cropping pattern, duty and delta, relationship in duty & delta, Duty at various places, measures for improving Duty of water, Water requirements for crops, Base period, quality of Irrigation water, frequency of irrigation, Methods of applying water to the field: surface, sub-surface, sprinkler and Drip irrigation. Examples.

6L

Module5 Irrigation canals: design principles of irrigation canals, navigation canals and drainage canals.Designofunlinedalluvialchannels bysilttheories:Introduction,SedimentLoad,Suspendedloadand its measurement, Bed load and its measurement, Kennedy's theory, procedure for design ofchannelbyKennedy'smethod, Lacey's theory,designprocedurebyLacey's theory,Crosssectionofanirrigationcanal,balancingdepth.Example.	8L
Module6 Lining of Irrigation canals: Objectives, advantages and disadvantages of canal lining, economicsand requirement of canal lining. Water logging and drainage: causes, Effects and prevention ofwaterlogging. Typesofopendrainandscloseddrains, canaloutlets, landreclamation. Example.	4L

Text/ReferenceBooks:

Name	Author	Publishers
Irrigation Engineering & Hydraulic Structures	S. K. Garg	
Fluid Mechanics	A.K. Jain	

CO-POmapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	2	2	-	-	2	3	-	1	2	-	1	2	2	-
CO 2	2	-	1	2	1	1	-	2	2	-	2	2	2	2	-
CO 3	-	1	1	2	3	2	1	-	2	1	-	-	2	2	-
CO 4	1	2	-	1	1	3	1	2	1	-	1	2	2	2	-
CO 5	-	1	1	-	1	-	-	-	-	2	1	1	2	2	-

COURSE NAME: OPERATIONS RESEARCH HC COURSE CODE: CE604A CONTACT: 4:0:0 TOTAL CONTACT HOURS: 48 HRSC REDITS: 4	
Prerequisites: Basic concepts of Probability distribution, statistical estimation, regression analysis and ANOVA, Basic Mathematics	
Course Objective: 1) To study various optimization techniques in real world problems related to civil engineering 2) To study the inventory models 3) To study about assigning jobs to people in an efficient way 4) To study about sequencing techniques 5) To understand transportation model utility in construction industry	
Course Outcome: CO1: At the end of the course, the students will be able to identify and develop operational research models from the verbal description of the real system. CO2: Apply the mathematical tools that are needed to solve optimization problems. CO3: Use mathematical software to solve the proposed models. CO4: Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision making processes in Management Engineering.	
Course contents:	
Module 1: Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.	10L
Module 2: Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.	8L
Module 3: Network Techniques: Shortest path model, minimum spanning tree problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT.	10L
Module 4: Theory of Games: Rectangular games, Minimax theorem, graphical solution of $2 \times n$ or $m \times 2$ games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queuing model, single server models.	10L
Module 5: Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.	10L

Text/ReferenceBooks:

Name	Author	Publishers
OperationsResearch	WayneL	ThomsonLearn ing,2003.
OperationsResearch-AnIntroduction	HamdyH.Taha	PearsonEducati on,2003
OperationsResearch	R.PanneerSeevam	PHILearning, 2008
TotalQualityManagement	V.K.Khanna	NewAgeInternational, 2008
Linear Programming and Theory ofGames	P. M.Karak	ABSPublishingHouse
Linear Programming and Theory ofGames	Ghosh andChakrab orty	CentralBookAgency
OperationsResearch	M. V.DurgaPrasad	CENGAGELearning

CO-POmapping:

	PO1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO1 2	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	2	-	3	-	-	3	2	2	-
CO2	-	-	-	-	-	1	-	1	-	3	-	1	2	2	-
CO3	-	-	-	-	-	2	-	-	-	-	-	1	2	2	-
CO4	-	-	-	-	-	3	2	-	3	3	-	2	2	2	-

COURSE NAME: HUMAN RESOURCE MANAGEMENT COURSE CODE: CE604B CONTACT: 4:0:0 TOTAL CONTACT HOURS: 48 HRSC REDITS: 4	
Prerequisites: Basic concepts of Management and Planning	
Course Objective: 1) Explain the importance of human resources and their effective management in organizations 2) Demonstrate a basic understanding of different tools used in forecasting and planning human resource needs 3) Outline the current theory and practice of recruitment and selection and demonstrate the ability to prepare a selection strategy for a specific job. 4) Evaluate a benefits package that supports the organization's strategy in line with HRM cost-containment policies and practices and Recommend actions based on results of the compensation analysis and design compensation schemes that are cost effective, that increase productivity of the workforce, and comply with the legal framework 5) Explain their understanding of the administrative complexities of providing a full array of benefits to employees and the ways and means of delivering these benefits	
Course Outcome: CO1: To understand principles, processes and practices of human resource management. CO2: To identify problems or barriers which complicate and distort the effectiveness of human resource planning. CO3: To understand various provisions contained in labour legislation relating to Industrial relations. CO4: Apply HR concepts and techniques in strategic planning to improve organizational performance.	
Course contents:	
Module-1: Introduction Human Resource Management- Objectives, Scope and Significance of HRM, Functions of HRM, Problems and Prospects in HRM, Environmental scanning.	8L
Module-2: Planning, training and development Human Resource Planning, Demand Forecasting Techniques, Supply Forecasting Techniques, Analysing work and designing jobs, Recruitment and Selection, Interviewing Candidates. Human Resource Development, Orientation, Training and Development, Management Development, Performance Appraisal and Employee Compensation, Factors Influencing Employee Remuneration and Challenges, Incentives and benefits	10L
Module-3: Labour Laws Contract Labour Act, Equal Remuneration Act, Minimum Wage, Payment of wage, Gratuity, Bonus payment, Industrial Disputes and Discipline.	10L
Module-4: Managing Ethical Issues in Human Resource Management Workers Participation in Management, Employee safety and health, Managing Global Human Resources and Trade Unions, International HRM, Future of HRM and Human Resource Information Systems.	8L

Text/ReferenceBooks:

1. Aswathappa, Human Resource Management—TMH., 2010.
2. Garry Dessler and Biju Varkkey, Human Resource Management, PEA., 2011.
3. Noe & Raymond, HRM: Gaining a Competitive Advantage, TMH, 2008.
4. Bohlander George W, Snell Scott A, Human Resource Management, Cengage Learning, 2009.
5. William J Bruns Jr. "Performance Measurement, Evaluation and Incentives", Tata McGraw
6. Monappa A, "Personnel Management", Tata McGraw Hill, New Delhi, 1997
7. Rao T, "HRD in the New Economic Environment", Tata McGraw Hill

CO-PO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	2	-	-	-	-	3	2	-	3	2	2	-
CO 2	-	2	-	3	-	2	-	2	-	3	-	2	2	2	-
CO 3	-	2	-	3	-	-	-	-	-	3	2	2	2	2	-
CO 4	2	-	-	-	-	3	2	-	-	2	3	-	2	2	-

COURSE NAME: STUDIES ON SIX SIGMA COURSE CODE: CE604C CONTACT: 4:0:0 TOTAL CONTACT HOURS: 48 HRSC CREDITS: 4	
Prerequisites: Basic concepts of Management and Planning	
Course Objective: <ol style="list-style-type: none"> 1. To translate the selection, application and implementation of a Six Sigma project including roles and responsibility of team members 2. Collect appropriate data from process to support problem solving. 3. Create details flowchart and process maps. 4. Demonstrate ability to control and monitor process. 	
Course Outcome: CO1: Understand requirement of implementation of Six Sigma. CO2: Relate Six Sigma concept to the overall business mission and objective. CO3: Understand Six Sigma methodology including DMAIC. CO4: Employ Six Sigma skill to lead a successful process improvement project for a meaningful result	
Course contents:	
Module 1: Introduction—General History of Six Sigma, Evolution and Value of Six Sigma, The Basics and meaning of Six Sigma, Basic Concepts of variation.	4L
Module 2: Six sigma Roles and responsibilities, Implementing Six Sigma, Six Sigma Roadmap, Process Mapping, Lean Principles and Value Stream Mapping, Selection and defining Six Sigma Projects.	4L
Module 3: Becoming a Customer and Market-Driven Enterprise, Voice of the customer, Customer Expectations and Needs, Linking Six Sigma Projects to Strategies	3L
Module 4: Attributes of Good Metrics, Using Resources Wisely, Project Management Using the DMAIC and DMADV Models	3L
Module 5: The Lean enterprise, The History of Lean, Understanding lean, Lean & Six Sigma, The seven elements of waste	3L
Module 6: The Define Phase— Defining a process, Critical to Quality Characteristics, Cost of Poor Quality, Basic Six Sigma Metrics, Pareto Analysis	3L
Module 7: The Measure Phase— Process Definition, Cause and effect/Fishbone Diagram, Basic Probability and Statistics, X-Y Diagram, Normal Distribution and Normality, Precision & Accuracy, Process Capability	4L
Module 8: The Analyze Phase- Pattern of Variation, Multi-Vari Analysis, Inferential Statistics, Sampling	4L

Techniques&Uses,CentralLimitTheorem,HypothesisTesting,ConfidenceIntervals,AnalysisofVariance(ANOVA)															
Module 9: ImprovePhase:Simple linearRegression,Correlation,RegressionEquations,Residual analysis,MultipleandNon-linearregression,Datatransformation,BoxCox.															4L
Module 10: TheControlPhase:LeanControls,ControlMethodsfor5S,Kanban,Poka–Yoka(Mistake Proofing), Statistical process Control (SPC), Data collection of SPC, Six Sigma Control Plans,Cost benefitanalysis,ElementsofcontrolPlan,ElementsofResponse Plan.															4L
Text/ReferenceBooks:															
Name			Author					Publishers							
Simplifiedsixsigmamethodologytools			N. GopalaKrishnan PHandimplementation					Zorba							
Eightstepstoproblemsolving- sixsigma			MohitSharma					Zorba							
BooksSixSigmaHandbook			PYZBEK					-							
ASQCertified SixSigmaHandbook			AmericanSocietyof Quality					-							
CO-POmapping															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	1	-	1	-	-	-	-	-	-	-	1	2	2	-
CO 2	2	1	1	1	1	-	-	-	-	-	-	1	2	2	-
CO 3	3	3	3	2	2	-	-	-	-	-	-	1	2	2	-
CO 4	3	3	3	3	3	-	-	-	2	2	2	1	2	2	-

COURSE NAME: STRUCTURAL DESIGN AND DETAILING LAB**COURSE CODE: CE691****CONTACT: 0:0:3****CREDITS: 1.50****Prerequisites:**

Students should know about RCC and steel structure design of various structural components and building structure.

Course Objective: Students should be able to design structural components and RCC and steel structure. Students will be able to understand about the members of structure, different loading conditions, how it behaves and where to use such member.

Course Outcome:

CO1: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.

CO2: Design & detailing of (a) simply supported R.C.C. Beam (ii) Continuous T-Beam

CO3: Students should be able to Design & Detailing of columns, isolated and combined footing. CO4: Design of different units: Slab, beam column, roofing and staircase from floor plan of a multi-storied frame building, typical detailing of a two-way floor slab.

CO5: Problems on general consideration and basic concepts

LIST OF TOPICS:

1. General considerations: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.
2. Design & detailing of (a) simply supported R.C.C. Beam (ii) Continuous T-Beam.
3. Design & Detailing of columns, isolated and combined footing
4. Design & detailing of (a) simply supported one-way slab (ii) One-way Continuous slab.
5. Design of different units: Slab, beam column, roofing and staircase from floor plan of a multi-storied frame building, typical detailing of a two-way floor slab.
6. Problems on general consideration and basic concepts
7. Discussion on different loads (i.e. wind load, Dead load, live load and others) as per IS 875
8. Design & drawing of the following components of a roof truss: Members of the roof truss. Joints of the roof truss members, Purlins, Gable bracings, Column with bracing, Column base plate, Column foundation

Text Books/Reference Books:

R.C.C. design: Punmia, Jain, Jain

Design of Steel Structures - S.K. Duggal Tata Mc-Graw Hill, New

Delhi New Delhi Reinforced cement concrete design - Nilamshrama

Design of Steel structures N. Subramanian Oxford University

Press Design of steel structures A.S. Arya and J.L. Ajmani Nemchand & Bros.,

CO-PO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO1	3	2	2	2	2	1	1	2	1	1	1	2	2	2	2
CO2	3	2	2	2	2	2	2	2	2	2	2	1	2	3	3
CO3	3	2	2	2	2	1	1	1	2	1	2	2	3	2	3
CO4	3	1	1	1	1	2	1	1	3	2	2	2	3	2	3
CO5	3	3	3	1	1	1	2	2	2	2	2	2	3	2	2

COURSENAME:COMPUTERAIDEDDESIGN & DRAFTING LAB

COURSECODE: CE692

CONTACT:0:0:2

CREDITS:1.00

Prerequisites:Fundamentals of computer operation with basic knowledge of Structure Analysis and Design for different structural components with basic knowledge of engineering drawing.

Course Objective:Students will be familiar with features of detailing and design of structure by using software detailing of different structural elements and analysis and design of those by using softwares.

Course Outcome:

CO1:Students will be able to integrate the role of graphic communication in the engineering design process

CO2:Students will be able to use CAD software to generate a computer model and technical drawing for a simple, well-defined part or assembly.

CO3:Students will be able to apply basic concepts to develop construction (drawing) techniques and produce 2D Orthographic Projections

CO4:Understand and demonstrate dimensioning concepts and techniques

CO5:Become familiar with the use of Blocks, Design Center, and Tool Palettes, Solid Modeling concepts and techniques

LIST OF LESSONS:

1. Introduction and important features of a software dealing with analysis and design of structures
2. Analysis and design of a multi-storied building using software.
3. Preparation of detailed drawings of different structural elements including ductility detailing.
4. RCC Slab, beam, column and footing design.
5. Design and detailing of Steel Structures.
6. Analysis, Design and Detailing of Isolated and combined RC Footings

Text Books/Reference Books:

1. Design of RCC Buildings using STAAD Pro V8i with Indian Example: Static and Dynamic Methods – T.S. Sharma – Education Publishing
2. Exploring Bentley STAAD Pro CONNECT Edition – Prof. Sham Tickoo Purdue Univ. – Cadcam Technologies
3. Analysis and Design of Structures: A Practical Guide to Modelling – D. Trevor Jones – Bentley

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	1	1	1	3	3	1	3	3	3	3
CO2	3	3	3	1	2	2	1	-	2	2	2	3	3	3	3
CO	3	3	3	1	3	2	2	-	3	3	2	3	3	3	3

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

COURSE NAME: INDUSTRIAL TRAINING

COURSE CODE: CE693

CREDIT: 1.0

Course contents:

Collective Data from 3rd to 6th Semester (Summer/Winter Training during Semester Break & Internship should be done after 5th Semester or 6th Semester). All related certificates to be collected by the training/internship coordinator(s).

COURSE NAME: MINOR PROJECT II

COURSE CODE: PR691

CONTACT:0:0:2

CREDIT: 1

Course contents:

It is intended to start the project work in the semester. The students in a group of 4 to 6 works on a topic are to be approved by the head of the department under the guidance of a faculty member. The students prepare a comprehensive project report after completing the work to the satisfaction of the supervisor to be submitted at the end of the semester. The project work is evaluated based on oral presentation and the project report may jointly by examiners constituted by the Head of the Department.

4thYear7thSemester

Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE701	Advanced Transportation Engineering	3	1	0	4	4
2	ENGG	Major	CE702	Advanced Structural Analysis	3	0	0	3	3
				Advanced Foundation Engineering					
				Pavement Design					
3	ENGG	Major	CE703	D. Water and Wastewater Engineering	3	0	0	3	3
				E. Hydraulic Structure					
				F. Water Pollution and its Control					
4	SCI	Minor	CE704	D. Human Resource Development and Organizational Behavior	3	0	0	3	3
				E. History of Science & Engineering					
				F. Finite Element Method					
5	HUM	Minor	HU(CE)705	Economics for Engineers	3	0	0	3	3
B.PRACTICAL									
6	PROJECT	Major	PR781	Major Project-I	0	0	8	8	4
7	ENGG	Major	CE782	Internship (Min 1 month)	0	0	2	2	1.0
8	HUM	Ability Enhancement Course	HU(CE)791	Technical Seminar Presentation	0	0	1	1	0.5
9	ENGG	Skill enhancement Course	HU(CE)792	Skill Development : Technical article writing	0	0	1	1	0.5
Total of Theory, Practical and Mandatory Activities/Courses								26	22

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

COURSE NAME: ADVANCED TRANSPORTATION ENGINEERING C COURSE CODE: CE701 CONTACT: 3:1:0 TOTAL CONTACT HOURS: 48 HR SC REDITS: 4	
Prerequisites: Basic knowledge of transportation engineering with fundamentals of pavement design, alignment survey and testing procedure of road material, understanding basic methodology of transportation models and uses.	
Course Objective: Students will gain knowledge on traffic Engineering and transportation planning. Familiarity with railway engineering locations survey, Geometric design, signaling and track maintenance. To acquire knowledge on Airport engineering - runways, taxiways, aprons, wind rose diagram, design and taxiway and terminal building.	
Course Outcome: CO1: Learn about highway engineering and traffic engineering. CO2: Learn about airport engineering CO3: Learn about Railway engineering.	
Course contents:	
Module-I: Traffic Engineering : Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections – Basic traffic conflicts, classification of at-grade intersections, channelization, traffic signals, signs and marking; Road Safety	8L
Module-II: Transportation planning: Transportation planning at different levels; Transport Project planning – Planning studies and investigation; Elements of Urban Transportation Planning; Transport Demand Analysis; Preparation of Project Report	10L
Module-III: Railway Engineering: Locations surveys & alignment, Permanent way components, Gauges, Geometric Design, Points & crossings, Stations & Yards, Signaling, Track Maintenance	10L
Module-IV: Airport Engineering: Functional areas of airports: Runways, Taxiways, Aprons, Terminal buildings; Classification of Airports; Airport site selection; Design of Runway, Runway orientation, Wind Rose diagram; Design of Taxiway and Terminal Building	8L

Text/ReferenceBooks:

Name	Author	Publishers
TransportationEngineering	Vazirani&Chandola	-
TransportationEngineering	KhistyandLalPHI	-
ATextBookofRailway Engineering	S.P. Arora & S.C.Saxena	-
RailwayEngineering	SatishChandra	OxfordUniversitypress
AirportplanningandDesign	S.K.Khanna&M.G.Arora	
AirportTransportationPlanning& Design.	Virendra Kumar&SatishCh andra	GalgotiaPublicationPvt.Ltd.New Delhi

CO-POmapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	3	-	-	3	3	3	2	2	2	-
CO2	3	2	2	2	-	-	2	2	2	-	1	2	2	2	-
CO3	3	2	2	2	-	1	-	-	1	-	2	2	2	2	-

COURSE NAME: ADVANCED STRUCTURAL ANALYSIS COURSE CODE: CE702A CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRS CREDITS : 3	
Pre requisites: Students should have knowledge about the subjects Strength of Materials and Structural Analysis-I & II.	
Course Objective: 1. Learning the concept of Matrix method of analysis 2. Learning dynamic analysis of structural frames for wind loads. 3. Learning the theories of special structures like Plates & Shells. 4. Introduction to the advanced theories of elasticity.	
Course Outcome: CO1 : Students will understand matrix method of analysis. CO2 : Students will learn to evaluate wind loads on structures. CO3 : Students will learn to analyse plates and shell structures. CO4 : Students will be able to apply knowledge of elasticity in different coordinate systems.	
Course contents:	
Module-I: Matrix methods of analysis: Matrix formulation of redundant beam analysis (Clapeyron's three moment theorem. Stiffness and flexibility approaches for beams, simple portal frame, trusses by matrix formulation.	10L
Module-II: Dynamic analysis of structural frames: Wind analysis of structures by using I.S. Code provisions. IS 875-III to be followed for the Wind Load calculations.	6L
Module-III: Theory of plates and shells: Thin plate analysis. Differential equation of bending under point and uniformly distributed load, various support systems. Rectangular and circular plates. Membrane analysis of thin shell, meridional & hoop stress, shell of revolution, cylindrical shell, applications.	10L
Module-IV: Theory of Elasticity : Three dimensional stress and strain analysis, stress - strain transformation, stress invariants; equilibrium and compatibility equations, boundary conditions; Two dimensional problems in Cartesian and Polar coordinates. Beam bending problems; Energy principles, variational methods and numerical methods.	10L

Name	Author	Publishers
Structural analysis (A Matrix approach)	Pandit Gupta	
Advanced structural analysis	Debdas Menon	

COURSE NAME: ADVANCED FOUNDATION ENGINEERING															
COURSE CODE	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CE702B	5	6	7	8	9	0	1	2							
CONTACT: 3:020	2	2	3	3	3	2	2	2	2	2	2	2	2	2	3
TOTAL CONTACT HOURS: 36 HRS						1	3	3	2	2	3	3	2	2	
CREDITS: 3	3	3	3	3	1	3	2	3	3	3	3	3	2	2	
CO1	3	2	2	2	2	3	2	2	2	3	3	1	2	3	3

Prerequisites:

Basic knowledge of soil mechanics with emphasis on soil behavior, parameters, test procedure. Knowledge on foundation and bearing capacity and settlement analysis. Preliminary knowledge on vibration and dynamics of structures.

Course Objective:

Students will gain knowledge on soil exploration and site investigation, with bearing capacity from SPT and SCPT and plate load test data. Students will be able to design beams on elastic foundation and raft foundation as per IS:2950.

Familiarity with deep foundation-pile, laterally loaded piles by as per code provisions and load carrying capacity and settlement analysis.

Students will acquire knowledge on retaining wall and sheet pile structures.

Familiarity with design of foundation for vibration control and foundation on expansive soils.

Course Outcome:

CO1: Determine suitable soil parameters

CO2: Design and analyze foundation systems using conventional methods

CO3: Design a budget and proposal for a Geotechnical investigation

CO4: Design appropriate foundation systems based on ground-investigation data and be able to select correct soil parameters for the designs

CO5: Understand limitations and uncertainties in geotechnical design

Course contents:**Module-I:****Soil Exploration and Site Investigation**

Planning of soil exploration programme, Field testing, Preparation of bore-log and soil investigation report, Geo-physical exploration: Seismic refraction survey, electrical resistivity method

4L**Module-II:****Shallow Foundations**

Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria. Beams on elastic foundation: Infinite beam, Finite beam, Modulus of sub-grade reaction and effecting parameters.

Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.

10L**Module-III:****Deep Foundations**

Pile: Tension piles, Laterally loaded piles: Elastic continuum approach, Ultimate load Analysis, Deflection and maximum moment as per IS 2911, Pile load test

Drilled Shaft: Construction procedures, Design Considerations, Load Carrying Capacity and settlement analysis, Caissons: Types, Sinking and control.

6L

Module-IV: Retaining walls and sheet pile structures Gravity, cantilever and counterfort retaining walls: Stability checks and design Sheet Pile Structures: Cantilever sheet piling, Anchored sheet piling: Free and fixed earth support methods of Analysis, Braced Excavation															8L	
Module-V: Design of foundation for vibration control Elements of vibration theory, Soil-springs and damping constants, dynamic soil parameters, Types of Machine foundations, General consideration in designing dynamic bases.															4L	
Module-VI: Foundations on expansive soils: Problems and Remedies															4L	
Text/Reference Books:																
Name			Author						Publishers							
Foundation Analysis & Design			J.E.Bowels						McGrawHill							
Principles of Foundation Engineering			B.M.Das						Thomson Book							
Foundation Design Manual			N. V.Nayak						Dhanpat Rai Publication Pvt.Ltd							
Foundations for Machines: Analysis and design			Shamsher Prakash, Vijay K Puri						Wiley Series in Geotechnical Engineering							
Advance Foundation Engineering			N.Som & S.C.Das													
Hand Book of Machine Foundation			P. Sirinivashalu & C.V. Vaiddyanathan						Tata McGraw Hill							
CO-PO mapping																
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	3	1	1	3	2	1	2	1	2	2	3	3	2	3	3	
CO2	3	3	3	2	2	1	2	2	2	1	3	3	3	3	3	
CO3	3	1	1	2	2	2	3	3	3	2	3	3	3	2	3	
CO4	3	3	3	3	3	2	3	2	2	2	2	3	3	3	3	
CO5	3	3	3	3	3	1	2	2	2	2	2	3	2	2	3	

Text/Reference Books	COURSE NAME: PAVEMENT DESIGN	
	COURSE CODE: CE702C	
COP mapping	CONTACT: 3:0:0	
	TOTAL CONTACT HOURS: 36 HRS	
	CREDITS : 3	
	Pre requisites: Concept of different types of pavement and its features based on IRC.	
	Course Objective: i) Introduction of different types pavements and its performance ii) Introduction of traffic loading in pavement design. iii) Description of characteristics of pavement materials. iv) Design of different types of pavement.	
	Course Outcome:	
COP mapping	CO1: Understanding the pavement performance under different circumstances. CO2: Mapping of pavement design.	
	Course contents:	
	MODULE – I: Principles of Pavement Design: Types of Pavements, Concept of pavement performance, Structural and functional failure of pavement, Different types of pavement performance, Different pavement design approaches.	8L
	Module- II: Traffic Consideration in Pavement Design: Vehicle types, Axle configurations, Contact shapes and contact stress distribution, Concept of standard axle load, Vehicle damage factor, Axle load surveys, Estimation of design traffic.	6L
	Module- III : Pavement Material Characterization: Identification of different type of materials Field and laboratory methods for characterization of pavement materials	6L
	Module- IV: Analysis and Design of Flexible Pavements: Selection of appropriate theoretical model for flexible pavements, Analysis of different layers of flexible pavements based on linear elastic theory, Different methods of design of flexible pavements, IRC guidelines (IRC-37).	8L
	Module –V: Analysis and Design of Rigid Pavements: Selection of appropriate theoretical models for rigid pavements, Analysis of wheel load stresses, curling, temperature differential, Critical stress combinations, Different methods of design of rigid pavements, IRC guidelines (IRC-58)	4L
	Module- VI: Pavement Overlay Designs : Overlay design as per Indian Roads Congress guidelines (IRC-81) Overlay design as per AASHTO-1993 guidelines.	4L

Name	Author
Principles of Pavement Design	E.J.Yoder and M.W. Witzak , Wiley publisher.
Pavement Analysis and Design Y. H. Huang Prentice-Hall	
Highway Engineering	Khanna and Justo Nem Chand
IRC-37, IRC-58, IRC-73, IRC-81, IRC-106 and other relevant IRC codes	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO 1	3	3	3	2	3	1	1	1	3	3	3	3	2	2	-
CO 2	3	3	3	2	2	2	1	1	3	2	3	2	2	2	-

COURSE NAME: WATER AND WASTE WATER ENGINEERING C COURSE CODE: CE703A CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Prerequisites: Fluid Mechanics or an equivalent course in fluid flow or hydraulics.	
Course Objective: Explore the relationship between the natural water cycle and human water use, and understand the principles of water resources planning and total water management. Describing the physical, chemical, and biological processes necessary for designing and managing drinking water treatment processes and water conveyance and distribution systems and the physical, chemical, and biological processes necessary for designing and managing primary, secondary, tertiary and advanced wastewater treatment processes and solid waste handling systems.	
Course Outcome: CO1 :Students will be able to summarize the quality parameters typically used to differentiate water and judge the different classes of treated wastewater CO2: Students will be able to describe various types of process units used for preliminary, primary and secondary treatment and explain how they achieve the target level of treatment CO3: Students will be able to identify and summarize emerging technologies for advanced wastewater treatment and water recycling CO4: Students will be able to differentiate water and wastewater treatment on solid waste management.	
Course contents:	
Module I: Water quality parameters, Water quality standards; conventional contaminants and emerging contaminants; Water treatment: Source selection process, selection of treatment chain, plant siting, Treatability studies. General considerations for source of drinking water; Water demand forecasting; Determination of reservoir capacity; Economics sizing of pumping mains/pumping station.	4L
Module 2: Sources of water, Quality and quantity of surface water, Reservoir storage capacity, Groundwater Flow, Groundwater Yield, Infiltration Gallery, Classification of different types of wells, Formation of cavity in wells, Measurement of open well yield, Tubewells, Different type of tube wells and its failure, Artesian well.	4L
Module-3: Principles of Water Treatment process: Historical overview of water treatment, Considerations for layout of treatment plant, Sedimentation, Coagulation & Flocculation processes, Disinfection/Chlorination, Water Softening, Filtration, removal of Dissolved Solids, Fluoride, Iron and Manganese etc. Water Pollution control and its Legislation.	6L
Module 4: Estimating the Design Sewage Discharge- Estimating Sewage Discharge, Design Periods for Different Components of a Sewerage Scheme, Future Forecasts and Estimating Design Sewage Discharge, Variations in Sewage Flow and their Effects.	4L
Module 5: Hydraulic Design of Sewers and S.W Drain Sections- Difference in the Design of Water Supply Pipes and Sewer Pipes and Sewer Pipes, Hydraulic Formulas for Determining Flow Velocities in Sewers, Effect of flow variations on Velocity in a Sewer, Hydraulic Characteristics of Circular Sewer, Quality and Characteristics of Sewage- Decomposition of Sewage,	6L
Module 6: Disposing of the Sewage Effluents- Disposal by Dilution, Disposal of Wastewaters in Rivers and Self, Disposal on Land for Irrigation, Dilution Method Vs Land Disposal Method	6L
Module 7: Municipal Wastewater Treatment Technologies Municipal wastewater treatment Pre-treatment, Primary treatment, Secondary treatment, Activated Sludge Process, Trickling Filters, Oxidation Pond, Waste Stabilisation Pond, Advanced treatments for Sewage., Sludge and its Moisture Content, Sludge Digestion Process,	6L

Text/ReferenceBooks:

Name	Author
WasteWaterTreatmentandWaterManagement:WaterTre atmentandManagement	AnamikaSrivastava
INDUSTRIAL WASTE WATERTREATMENT	A.D.Patwardhan

CO-POmapping

CO	PO 1	PO2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	1	2	3	2	-	-	2	1	3	1	-	-	2	2	-
CO2	2	1	1	-	3	2	-	2	-	2	3	2	2	2	-
CO3	-	1	-	-	2	1	1	-	1	1	1	2	2	2	-
CO4	2	1	-	3	1	2	2	2	-	-	1	1	2	2	-

COURSE NAME: HYDRAULIC STRUCTURE COURSE CODE: CE703B CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HR SCEDITS: 3	
Prerequisites: Basic course on hydraulics with emphasis on fluid behavior pressure losses and application of theories in real scenarios knowledge of seepage and groundwater calculation.	
Course Objective: Students will acquire knowledge on different elements of Hydraulic structure, diversion headwork, weirs, barrages. Familiarity with hydraulic design of canals, Ogee fall and cross drainage works. Aquatic knowledge on dams, earthen dams, method of construction, type, failure causes, seepage control in earthen Dam, gravity dam. Familiarity with spillways and its requirement capacity.	
Course Outcome: CO1: Students will be able to analyze and design hydraulic structures using of practice. CO2: Students will be able to Apply the basic design principle to engineering design practice CO3 : To define basic theories of hydraulic structure design concepts- cross drainage works, canal fall etc. CO4: To define basic theories of hydraulic structure design concepts- dams, culverts, siphon etc. CO5: To identify seepage under hydraulic structures and protection methods.	
Course contents:	
Module-1: Diversion Headworks: Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site, layout and description of each part, Effect of construction of a weir on the river regime, causes of failure of weir on permeable foundation and their remedies	4L
Module-2: Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift, Bligh's creep theory of seepage flow, Khosla's theory & concept of flow-nets, concept of exit gradient and critical exit gradient, Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage, necessary corrections, examples.	8L
Module-3: Hydraulic structures for canals: Canal falls, Description of ogee fall, Trapezoidal-notch fall, Syphon well drop. Examples	2L
Module-4: Cross-Drainage Works: Necessity, types, selection of a suitable type (Introduction only)	2L
Module-5: Dam (General): Definition, classification of Dams, factors governing selection of type of dam, selection of suitable site for a dam. Earthen Dams: Introduction, Types of Earthen Dams, Methods of Construction, Causes of failure, Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam, seepage control in Earthen Dam, Examples.	8L

[illegible]

COURSE NAME: WATER POLLUTION AND ITS CONTROL COURSE CODE: CE703C CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC CREDITS: 3	
Prerequisites: .This course is intended for undergraduate and first year graduate students. It is a science-based course that the students to be comfortable with mathematical calculations, physics and chemistry. Students who do not feel comfortable with these prerequisites will need to do outside self-study to progress satisfactorily through the course.	
Course Objective: <ol style="list-style-type: none"> 1. The focus of the course is to provide basics of air and water pollution sources, properties, measurement and control 2. The course will provide the students the knowledge of currently available air and water pollution control technologies and devices 3. The theory behind the control methods, design of pollution control devices and efficiency analysis, as well as their applications. 	
Course Outcome: CO1: Identify sources, types and quantities of pollutants and determine their impact on the environment CO2: Analyse pollutant transport issues in the environment and Development of transport equations CO3: Describe the operational principles of pollution measurement devices and discover their respective application CO4: Analyse and select appropriate treatment process for specific effluent emerging from industries CO5: Analyse and select and design various pollution control devices	
Course contents:	
Module-I: Water quality parameters, Water quality standards; conventional contaminants and emerging contaminants; Water treatment: Source selection process, selection of treatment chain, plant siting, Treatability studies. General considerations for source of drinking water; Water demand forecasting; Determination of reservoir capacity; Economics sizing of pumping mains/pumping station.	6L
Module-II: Sources of water, Quality and quantity of surface water, Reservoir storage capacity, Ground water Flow, Ground water Yield, Infiltration Gallery, Classification of different types of wells, Formation of cavity in wells, Measurement of open well yield, Tube wells, Different type tube wells and its failure, Artesian well.	6L
Module-III: Principles of Water Treatment process: Historical overview of water treatment, Considerations for layout of treatment plant, Sedimentation, Coagulation & Flocculation processes, Disinfection/Chlorination, Water Softening, Filtration, removal of Dissolved Solids, Fluoride, Iron and Manganese etc.	8L
Module-IV: Introduction to Water Pollution, Classification of Pollution, Water pollutants and sources, Water quality assessment, Effects of oxygen demanding wastewaters Dissolved oxygen and self-purification of rivers or streams.	4L

Module-V: Municipal Wastewater Treatment Technologies Municipal wastewater treatment Pre-treatment, Primary treatment, Secondary treatment, Activated Sludge Process, Trickling Filters, Oxidation Pond, Waste Stabilisation Pond, Advanced treatments for Sewage.	4L	
Module-VI: Industrial Wastewater Treatment Technologies Classification of industrial effluents Specific treatment process. Treatment of wastes from, Tanneries, Distilleries, Sugar mills, Pharmaceutical industries.	4L	
Module-VII: Prevention for Water pollution, Water Pollution Legislation, Water Management, Local Water Balance Reshaping.	4L	
Text/Reference Books:		
Name	Author	Publishers
1. Environmental pollution and control engineering,	C.S.Rao,	New Age International, 2007
2. Environmental Engineering,	A.P.Sincero,	
A Design Approach,	G.A.Sincero	Prentice Hall of India, 2002

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	3	-	1	1	2	2	2	-
CO2	2	-	-	2	1	2	3	1	1	2	2	1	2	2	-
CO3	-	2	1	1	2	2	1	1	2	-	-	-	2	2	-
CO4	1	1	2	-	-		-	-		1	2	1	2	2	-
CO5	-	-	1	2	1	1	1	-	2	-	1	2	2	2	-

COURSENAME:HUMANRESOURCEDEVELOPMENT AND ORGANIZATIONAL BEHAVIOR COURSECODE:CE704A CONTACT:3:0:0 TOTALCONTACTHOURS:36HRS CREDITS: 3	
Prerequisites: 10+2	
CourseObjective: To provide an understanding of the basic principles of organisational behaviour so as to acquaint the students with managerial skills and the required inputs with reference to human resource management.	
CourseOutcome: CO1: To define and explain the basic concepts of organizational behaviour and motivation CO2: To explain the essential concepts of organisational conflicts, resolution of conflicts through negotiation, change management and organisational development. CO3 : To familiarize the various aspects of HR, to deal effectively with people resourcing and talent management and HR functions in an organization. CO4: To understand the concepts of HRD, its role and importance in the success of organization. CO5: To develop an understanding towards compensation management and industrial relations.	
Coursecontents:	
Module-I: Introduction to HRM and Organizational Behaviour (OB): Human resource management (HRM) at work: Definition – HR Challenge –Management process, Changing environment of Human Resource Management: Work force diversity, Technological trends – Globalization, Strategic planning and HR today: Nature of strategic planning – Building competitive advantage – Human resource as a source of competitive advantage, Definition of organizational behavior (OB) and historical development: Definition –Goals of OB – Challenges and opportunities, OB in a global context: The global economy – Facing the international challenge – Behaviour across cultures	6L
Module-II: Foundation of individual behaviour: Biographical characteristics – Ability – Learning – Implication for performance and satisfaction, Values and attitudes: Importance of values – Types of values – Types of attitude –Attitude and consistency, Perception: Defining perception and its importance – Factors influencing perception, Personality & emotions: Personality determinants – Personality traits – Major personality attributes influencing OB, Emotional intelligence: Defining emotions – The six universal emotions – Emotions and national culture – OB applications, Individual decision making: The rational decision-making process – Improving creativity in decision making – Identifying problems – Ethics in decision making	6L
Module-III: Understanding and managing group behaviour: Defining & classifying groups: Formal group – Informal group – Command group – Task group – Interest group, Basic group concepts: Roles – Norms – Cohesiveness – Size – Composition – Status, Group decision making: Individual vs. group – Group decision making techniques, Understanding work teams: Team versus groups – Types of teams – Cross	4L

functional teams – Creating effective teams, Conflict and inter-group behaviour: Definition of conflict – Transitions in conflict thought – The conflict process – Intergroup relations	
Module-IV: Recruitment and placement: Nature of job analysis: Definition – Uses of job analysis information, Steps in job analysis, Methods of collecting job analysis information: Interview – Questionnaires – Observation – Quantitative job analysis techniques, Job description and specification: Job identification – Responsibilities and duties – Specification for trained versus untrained personnel, Recruitment and selection process: Introduction – Advertising – Employment agencies – Selection process – Basic testing concepts, Human resource planning and forecasting: Employment planning and forecasting – Factors in forecasting personnel needs – Forecasting supply of inside candidates – Recruiting job candidates	4L
Module-V: Training and development: Building employee commitment – Orientation and socialization, Training needs analysis: Task analysis – Performance analysis – Setting training objectives, Training techniques: On-the-job training – Job instruction training – Audiovisual techniques – Programmed learning, Information technology and HR – Training via the internet, Nature and purpose of management development: Definition – Succession planning, Job rotation and management: Coaching – Action learning – Advantage, Performance management & appraisal: Appraisal process – Appraisal methods – Problems and solutions – Role of appraisals in managing performance, Using HR to build a responsive learning organization: HR and systematic problem solving – Learning from experience – Transferring knowledge	4L
Module-VI: Compensation and retention: Basic aspects of compensation: Compensation at work – Legal considerations in Compensation, Pricing managerial and professional jobs: Basic compensation elements – Compensating professional employees, Current trends and issues in compensation: Skill-based pay – Broad banding, Comparable worth – Pay secrecy – Inflation and salary compression, Financial incentives: Use of financial incentives – Types of incentive plans, Retirement benefits: Social security – Pension plans – Other retirement benefits, Employee service benefits: Job-related service benefits – Executive perquisites – Law for working women, Retention of employees, Definition- Strategy- Benefits	4L
Module-VII: Labour relations & legislation: The labour movement, unions and the law: Introduction – Why do workers organize – Background – Labour law today, Guaranteed fair treatment and employee discipline: GFTP at work – Fairness in disciplining – Discipline guidelines – Discipline without punishment, Managing dismissals: Definition – Grounds for dismissal – Dismissal procedure, Salient provisions under Indian Factories Act: Labour issues – Factory Act 1948, Industrial Disputes Act: Objective – Applicability, Employees State Insurance Act: Definition – Commencement and application, Workmen's Compensation Act: Definition – Employer's liability for compensation, Payments of Bonus Act: applicability- Eligibility- Benefits.	4L
Module-VIII: Global HRM & Organizational development (OD): Nature of global HRM: Strategic overview – HR and the international business – HR challenges of international business, Multinational and global corporations: Market imperfections – International power – Criticisms of multinationals, The expatriate manager in	4L

multinational corporations: Introduction – Selecting the expatriate manager – Training, OD values and outcomes: Respect for people – Trust and support – Power equalization – Confrontation, Implementation issues in OD and difference in organizational cultures: Improved organizational effectiveness – Greater commitment and involvement – Increased personal and organizational awareness	
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REFERENCE BOOKS:

1. Organizational Behavior-Stephen P. Robbins, Prentice-Hall of India, New Delhi
2. Human Resource Management- Gary Dessler, Pearson Education
3. Human Resource Management- Cynthia D. Fisher, Schoenfeldt & Shaw, Biztantra, New Delhi

TEXT BOOKS

1. K. Aswathappa, Organizational Behaviour, 12th edition, Himalaya, 2016
2. Edwin B. Flippo, Personnel Management, 6th edition, TMH, 2013
3. P. Subba Rao, Management & Organizational Behavior, 2nd edition, Himalaya, 2014
4. C.B. Mamoria & VSP Rao, Personnel Management, 20th edition, Himalaya, 2015
5. Stephen P. Robbins, Organisational Behaviour, 11th edition, PHI Learning / Pearson Education, 2008

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	3	-	1	1	2	2	2	-
CO2	2	1	1	2	1	2	3	1	1	2	2	1	2	2	-
CO3	-	2	1	1	2	2	1	1	2	-	-	-	2	2	-
CO4	1	1	2	-	-	-	-	-	-	1	2	1	2	2	-
CO5	-	-	1	2	1	1	1	-	2	-	1	2	2	2	-

COURSENAME:HISTORY OF SCIENCE & ENGINEERING COURSECODE:CE704B CONTACT:3:0:0 TOTALCONTACTHOURS:36HRS CREDITS: 3	
Prerequisites: 10+2	
CourseObjective: <ol style="list-style-type: none"> 1. Students will learn the general course of human history in multiple areas of the world. 2. Students will learn to understand the world contextually, that is, to interpret human experiences and the meanings people have given them in relationship to the place and time in which they occurred. 3. Students will learn to understand, analyze, and evaluate both evidence and arguments. 4. Students will learn to explain how and why important events happen and change over time occurs. 5. Students will learn to create knowledge and communicate it to others both orally and in writing. 	
CourseOutcome: CO1: Students will understand the Beginning and Development in different field of Science in ancient, medieval, and in modern period CO2: Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc. CO3 : Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc. CO4: Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	
Coursecontents:	
Module-I: Science and Technology- The Beginning: Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine; Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India; Development of Geography: Geography in Ancient Indian Literature	8L
Module-II: Developments in Science and Technology in Medieval India:Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of makhtabs, madrasas and karkhanas set up; Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine; Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc	8L
Module-III: Developments in Science and Technology in Colonial and Independent India:Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company's Service; Indian Response to new Scientific Knowledge, Science and Technology in Modern India; Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites and Development of ISRO	10L

Module-IV:

Prominent scientist of India since beginning and their achievement: Mathematics and Astronomy: Baudhayan, Aryabhatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna; Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga & Patanjali; Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Acharya Prafulla Chandra Roy, Satyendra Nath Bose, Meghnad Saha, Homi Jehangir Bhabha and Dr. Vikram Sarabhai

10L**REFERENCE BOOKS:**

1. Binod Bihari Satpathy. "History of Science and Technology in India". Development. Volume 29.
2. G. Kuppuram. 1990. "History of Science and Technology in India". South Asia Books.
3. M. Bhardwaj. 2010. "History of Science and Technology in Ancient India". Bookwin

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	3	-	1	1	2	2	2	-
CO2	2	3	-	2	1	2	3	1	1	2	2	1	2	2	-
CO3	3	2	1	1	2	2	1	1	2	-	-	-	2	2	-
CO4	3	1	2	-	-	-	-	-	-	1	2	1	2	2	-
CO5	2	3	1	2	1	1	1	-	2	-	1	2	2	2	-

COURSE NAME: FINITE ELEMENT METHOD COURSE CODE: CE704C CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Prerequisites: Basic knowledge of structural analysis for determinate and indeterminate structures, trusses and behavior of plates and preliminary knowledge of standard structural software and computer uses knowledge of matrices algebra.	
Course Objective: Students will gain knowledge on finite element analysis, finite element formulation techniques, element properties and numerical integration. Students will be able to formulate stiffness matrices and analysis of continuous beam and simple plane frame. To acquire knowledge on FEM for two dimensional analysis, FEM for plates and introduction of standard FEM in civil engineering.	
Course Outcome: CO1: Obtain an understanding of the fundamental theory of the FEA method. CO2: Develop the ability to generate the governing FEA equations for systems governed by partial differential equations. CO3 : Make the students to apply the knowledge of mathematics, science and engineering to do the analysis of simple and complex elastic structures using the finite element analysis. CO4: Learn and apply finite element solutions to structural, thermal, dynamic problems to develop the knowledge and skills needed to effectively evaluate finite element analysis	
Course contents:	
Module-I: [3L+1T] Introduction to Finite Element Analysis: Introduction, Basic Concepts of Finite Element Analysis, Steps in Finite Element Analysis, Fundamental concepts of Elasticity	4L
Module-II: [3L+1T] Finite Element Formulation Techniques: Virtual Work and Variational Principle, Galerkin Approach, Displacement Approach, Stiffness Matrix and Boundary Conditions	4L
Module-III: [6L+2T] Element properties: Concepts of shape functions: Natural Coordinates, one dimensional, Triangular, Rectangular Elements Isoparametric Formulation: Isoparametric Elements, Stiffness Matrix of Isoparametric Elements, Numerical Integration: One Dimensional, Two Dimensional	6L
Module-IV: [9L+3T] Formation of stiffness matrices and analysis of Truss, Continuous Beam and Simple Plane Frame.	10L

Module-V:[4L+2T] FEMfortwodimensionalanalyses:Constant StrainTriangle,LinearStrainTriangle,RectangularElements	4L
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IntroductiontoFiniteElementinE ngineering	Chandrapatla&Belegundu	PearsonEducation
AFirstCourseinFiniteElementMethod	D. L.Logan	Thomson
Surveying:	Bannister,Raymond& Baker	PearsonEducation
ConceptsandApplications ofFiniteElementAnalysis	R.D.Cooket.al	WileyIndia
FiniteElementAnalysis– TheoryandProgramming	C.S.Krishnamoorthy	TataMcgraw Hill
Matrix,FiniteElement,ComputerandS tructuralAnalysis	M. Mukhopadhyay OxfordandIBHPublishingC o.Pvt. Ltd.	NewDelhi, India
FiniteElementProcedures	K.J.BathePHI,	NewDelhi, India

Module-VI:[3L+1T] FEMforPlates:IntroductiontoPlateBendingProblems,FiniteElementAnalysisofThinPlate	4L
Module-VII:[3L+1T] Introductionto applicationofstandardFEMsoftwareincivilEngineering	4L

Text/ Reference Books:

CO- PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	3	2	2	3	3	3	2	3	3	3
CO2	3	3	3	3	2	2	2	3	2	3	3	3	3	2	3
CO3	3	3	3	3	2	3	3	2	3	2	2	2	2	3	2
CO4	2	2	2	3	2	2	2	2	1	1	2	1	1	3	2

COURSE NAME: ECONOMICS FOR ENGINEERS COURSE CODE: HU(CE)705 CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HR CREDITS: 3	
Prerequisites: NIL	
Course Objective: <ul style="list-style-type: none"> • To develop decision making skills using basic economic principles • To educate the students in evaluating various Business Projects 	
Course Outcome: CO1: To learn the identification of various uses for scarce resources. CO2: To understand key economic concepts and implement them in real life problems. CO3: To design sustainable and effective economic models in real life projects. CO4: To apply critical thinking skills in analysing financial data and their impacts.	
Course contents:	
Module– 1: Introduction Economics-Nature, Scope, Uses, Micro Economics and Macro Economics.	3L
Module– 2 Theory of Demand and Supply Concept of demand, Determinants of demand, Individual and Market Demand, Law of demand and its Exception; Concept of Supply, Shift in Demand and Supply Curve, Movement along the demand and supply curve, Determinants of equilibrium price and quantity, Elasticity of Demand and Supply.	5L
Module– 3 Theory of Production and Costs Concept of Production function, types of Production function, Laws of return to scale and variable Proportion, Basic understanding of different markets, Determination of equilibrium price under perfect competition & monopoly in short run and long run; Price Discrimination.	8L
Module-4 Macroeconomic Aggregates and Concepts Concepts of National Income, GDP, GNP, Concept of Business Cycle.	4L
Module-5 Inflation Concept, Causes and Remedies of Inflation and Unemployment, basic concept of Philips Curve	4L

Module-6–TheoryofInvestment Basic conceptofInvestment, BusinessFixedInvestment,AcceleratorTheory,Tobin’sq	4L
Module -7 Accounting BasicconceptofJournal, PreparationofIncomeStatementandBalanceSheet	4L
Module–8Cost VolumeProfit Analysis Contribution, P/V Ratio, Break-Even Point, Margin of Safety, Short term decision making: Make orBuy,Shut-downpoint,ExportPricing,OpportunityandSunkcost.	4L

Text/ReferenceBooks:

1. Economics,byLipseyandChrystal,OxfordUniversityPress
2. ModernAccountancy,vol.-I-
,byHanif&Mukherjee,TataMgrowHillReferences:
1. ModernEconomicTheory,byK.K.Dewett,S.Chand
2. PrinciplesofEconomics,byH.L.Ahuja,S.Chand
3. EngineeringEconomics,byR.PaneerSeelvan,PHI
4. EconomicsforEngineers,byDr.ShantanuChakraborty&Dr.Nilanjanasingharoy,LawPointPub
5. MacroEconomics,byMankiw,MacmillanLearning

CO-POmapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	2	3	3	-	2	3	2	2	2	2	2	-
CO2	2	2	3	2	3	-	-	-	-	-	3	2	2	2	2	-
CO3	2	-	3	2	-	3	-	-	2	-	-	-	2	2	2	-
CO4	-	2	2	3	2	3	-	-	-	-	3	2	-	2	2	-

COURSE NAME: MAJOR PROJECT-I

COURSE CODE: CE781

CONTACT: 0:0:8

CREDIT: 4

Prerequisite: Science and Engineering knowledge

It is intended to start the project work early in the seventh semester. The project problem is expected to be completed in the seventh semester and the demonstration and report writing will be carried out in the eighth semester. The students in a group of 4 to 6 work on a topic are to be approved by the head of the department under the guidance of a faculty member. The students prepare a comprehensive project report after completing the work to the satisfaction of the supervisor to be submitted at the end of the semester. The progress of the project is evaluated by a committee may be constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report may jointly by external and internal examiners constituted by the Head of the Department.

COURSE NAME: INTERNSHIP

COURSE CODE: CE782

CREDIT: 1.0

Course contents:

Collective Data from 3rd to 7th Semester (Summer/Winter Training during Semester Break & Internship should be done after 5th Semester to 7th Semester). All related certificates to be collected by the training/internship coordinator(s).

COURSE NAME: TECHNICAL SEMINAR PRESENTATION

COURSE CODE: HU(CE)791

CONTACT: 0:0:1

TOTAL CONTACT HOURS: 12

CREDIT: 0.5

Prerequisite: English language

Course Contents:

Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration, C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Technical Presentation: Strategies & Techniques: Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and nonverbal means.

COURSE NAME: SKILL DEVELOPMENT- TECHNICAL ARTICLE WRITING

CODE: HU(CE)792**CONTACT HOURS: 0:0:1****CREDIT: 0.5****Course contents:****Writing a Technical Report/Article**

- (a) Organizational Needs for Reports and types
- (b) Report Formats
- (c) Report Writing Practice Sessions and Workshops

4 th Year8 th Semester									
Sl.No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	CE801	D. Structural Dynamics and Earthquake Engineering	3	0	0	3	3
				E. Public Transport System					
				F. Ground Improvement Techniques					
2	ENGG	Major	CE802	D. Bridge Engineering	3	0	0	3	3
				E. Pre-stressed Concrete					
				F. Air & Noise Pollution and Control					
3	ENGG	Minor	CE803	D. Project Management	3	0	0	3	3
				E. Cyber Law and Ethics					
4	HUM	Ability Enhancement Course	HU(CE)801	Principles of Management	2	0	0	2	2
B.PRACTICAL									
5	PROJECT	Major	PR881	Major Project-II	0	0	12	12	6
6	ENGG	Major	CE882	Grand Viva	0	0	2	2	1
Total of Theory, Practical and Mandatory Activities/Courses								25	18

*‘Mandatory Additional Requirement’(MAR) activities have to be carried out as per university guidelines.

**COURSENAME:STRUCTURALDYNAMICS&EARTHQUAKEENGINEERINGC
OURSECODE:CE801A
CONTACT:3:0:0
TOTALCONTACTHOURS:36HRSC
REDITS:3**

Prerequisites: Students should know about earthquake, retrofitting and dynamics of the structure	
Course Objective: Students should be able to deal dynamic behaviour and dynamics of structure as well as earthquake resistant design properly.	
Course Outcome: CO1 : Student will be able to know Degrees of freedom, Undamped single degree freedom system, Damped single degree freedom system CO2: Student will be able to know about Response of single degree freedom system due to harmonic loading CO3: Student will be able to know about Duhamel's Integral, Response due to constant force, Rectangular load, Introduction to numerical evaluation of Duhamel's integral of undamped system. CO4 : Student will be able to know about Fundamentals: Elastic rebound theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc., Seismographs, Seismic zoning, Response of Simple Structural Systems CO5: Student will be able to know about Principles of earthquake resistant design	
Course contents:	
Module-I: Theory of vibrations: Degrees of freedom, Undamped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Introduction to multiple degree freedom system	7L
Module-II: Response of single degree freedom system due to harmonic loading: Undamped harmonic excitation, Damped Harmonic excitation	7L
Module-III: Response due to Transient loading: Duhamel's Integral, Response due to constant force, Rectangular load, Introduction to numerical evaluation of Duhamel's integral of damped system.	7L
Module-IV: Elements of seismology: Fundamentals: Elastic rebound theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc., Seismographs, Seismic zoning, Response of Simple Structural Systems	7L
Module-V: Principles of earthquake resistant design: Terminology, General principles and Design criteria, Methods of Analysis, Equivalent lateral force method of Analysis for multi-storied building as per Indian Standard Code of Practice, Introduction to Response Spectrum Method, Fundamental concepts of Ductile detailing	8L

Text/ReferenceBooks:

Name	Author	
	Publishers StructuralDynamics (Theoryand MarioPaz	
	CBSPublishersandComputation) Distributor	
DynamicsofStructure (Theoryand EducationApplicationtoEarthquakeEngineering)	A.K.Chopra	Pearson
ElementsofEathquakeEngineering	JaiKrishna, A.R. ChandrashekharandBrij	SouthAsianPublishers
	esh	
	ChandraN.C.SinhaandS .K.Roy	

EarthquakeResistantDesign

D.J.Dowrick

JohnWilley&SonsIS1893(Part1):2002,IS3920,I

S4326-

BureauofIndianStandard

CO-POmapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	3	3	1	2	3	3	3	3	2	2	3
CO2	3	3	3	2	2	2	3	1	3	2	3	2	2	3	3
CO3	2	2	3	2	1	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	3	2	2	1	2	3	2	2	2	3	3	3
CO5	3	3	3	3	3	1	1	1	3	3	2	3	2	2	3

COURSE NAME: PUBLIC TRANSPORT SYSTEM C COURSE CODE: CE801B CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Prerequisites: Basic knowledge of Civil Engineering	
Course Objective: <ul style="list-style-type: none"> • Explain different transit modes, routing management activities including demand analysis. • Provide information on functioning, designing and scheduling of transit terminal design, fleet management, and cost benefit analysis and bus transit operation. • Provide information on loading and unloading transit platforms, traffic management techniques and IPT service improvements. • Explain demand management techniques, intersection management techniques, planning for pedestrian, bicycle and parking management. 	
Course Outcome: CO1 : Able to remember transit modes, management activities and demand analysis. CO2 : Capable of designing transit terminal units, fleet management and cost analysis. CO3: Capable of planning and scheduling transit terminal platform for loading and unloading, selecting suitable traffic management techniques. CO4: Capable of selecting different demand management techniques, intersection management techniques and small area management.	
Course contents:	
Module 1: System and Technologies: Urban passenger transportation modes, transit classifications and definitions, theory of urban passenger transport modes, rail transit, bus transit, Paratransit and ridesharing, designing for pedestrians, trends in transit ridership and use of different modes.	8L
Module 2: Comparing Alternatives: Comparing costs, comparative analysis, operational and technological characteristics of different rapid transit modes, evaluating rapid transit Planning: Transportation system management, system and service planning, financing public transportation, management of public transportation, public transportation marketing.	10L
Module 3: Transit System Evaluation: Definition of quantitative performance attributes, transit lane capacity, way capacity, station capacity, theoretical and practical capacities of major transit modes, quantification of performance	8L
Module 4: City Traffic: Classification of transportation systems, conventional transportation systems, unconventional transportation systems, prototypes and tomorrow's solutions, analysis and interpretation of information on transportation systems, perspectives of future transportation.	10L

Text/ReferenceBooks:

Name	Author	Publishers
PublicTransportation	GeorgeE.GrayandL esterA.Hoel	PrenticeHall, NewJersey
UrbanPublicTransportation SystemsandTechnology	VukanRVuchic	PrenticeHallInc.,NewJersey
CityTraffic-ASystemsDigest'	HorstR. Weigelt,Rainer E.Gotz,Helmut H.Weiss	VanNostrandReinhold Company,New York
MetropolitanTransportation Planning'	JohnW. Dickey	TataMcGraw- HillPublishingCo.NewDelhi

CO-POmapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	3	-	-	-	-	-	-	2	2	2	-
CO2	3	2	2	2	1	-	-	-	-	-	-	2	2	2	-
CO3	2	2	2	2	2	-	-	-	-	-	-	1	2	2	-
CO4	3	2	2	3	2	-	-	-	-	-	-	3	2	2	-

COURSE NAME: GROUND IMPROVEMENT TECHNIQUES CO URSE CODE: CE801C CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HR SC REDITS : 3	
Prerequisites: Knowledge of Basic Soil Mechanics / Fundamental Geotechnical Engineering	
Course Objective: To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques. • To bring out concepts of reinforced earth. • Application of geotextiles in various civil engineering projects.	
Course Outcome: CO1: Understand the different ground improvement techniques. CO2: Understand the methods of stabilisation CO3: Understand the methods and properties of reinforced soil CO4: Understand the basic concepts of geosynthetics CO5: Understand the basic concept of consolidation of soil CO6: Understand the concept of shear strength in soil	
Course contents:	
Module-I: Introduction: Definition, Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground improvement.	4L
Module-II: Mechanical stabilization: Shallow and deep compaction requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods Dynamic compaction.	6L
Module-III: Hydraulic modification: Ground Improvement by drainage, Dewatering methods. Design of dewatering systems, Preloading, Vertical drains, vacuum consolidation, Electro-kinetic dewatering, design and construction methods.	6L
Module-IV: Modification by admixtures: Cement stabilization and cement columns, Lime stabilization and lime columns. Stabilization using bitumen and emulsions, Stabilization using industrial wastes Construction techniques and applications.	6L
Module-V: Grouting: Permeation grouting, compaction grouting, jet grouting, different varieties of grout materials, grouting under difficult conditions.	4L
Module-VI: In situ soil treatment methods: Soil nailing, rock anchoring, micro-piles, design methods, construction techniques.	4L
Module-VII: Case studies: Case studies of ground improvement projects.	6L

Text/ Reference Books:

Name	Author	Publishers
Foundation Analysis & Design	J.E.Bowels	McGrawHill
Principles of Foundation Engineering	B.M.Das	Thomson Book
Foundation Design Manual	N.V.Nayak	Dhanpat Rai Publication Pvt.Ltd
Construction and Geotechnical methods in foundation engineering	R.M.Koener	McGrawHill
Technology in tunnelling and dam construction	A.V.Shroff.&D.L.Sah	Oxford and IBH Publishing Co.Pvt.Ltd
Reinforced Earth	TS Ingold	Thoam Telford
Designing with Geosynthetics	RM Koerner	Prentice Hall

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	3	2	1	2	2	3	2	3
CO2	3	3	1	2	3	2	1	1	2	3	1	3
CO3	3	3	2	2	3	3	3	3	1	1	2	3
CO4	3	3	1	3	1	2	2	1	2	1	1	3
CO5	3	3	1	1	2	1	2	2	3	2	2	3
CO6	3	2	3	1	2	2	2	1	2	2	1	1

COURSE NAME: BRIDGE ENGINEERING C COURSE CODE: CE802A CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC CREDITS: 3	
Prerequisites: Students should have knowledge about how to solve analysis of structural problem, reinforced concrete structure design and steel structure design.	
Course Objective: Student will be able to know about the bridges and perform analysis of different types of bridges and also able to design of reinforced concrete and steel bridges of different types.	
Course Outcome: CO1 : Exhibit the knowledge of the history of bridges and know about the IRC guidelines. CO2: Design the RCC bridges of different type. CO3: Design the Balanced Cantilever Bridges. CO4 : Design the steel bridges of different type, schedule, and safety requirements. CO5: Exhibit the knowledge of Composite Bridges and Cable Stayed Bridges.	
Course contents:	
Module-I: [4L] Introduction: Definition and Basic Forms, Component of bridge, classification of bridge, short history of bridge development. I.R.C Loads. Analysis of IRC Loads, Impact factors, Other loads to be considered, Importance of Hydraulic factors in Bridge Design.	4L
Module-II: [4L] Reinforced concrete solid slab bridge: Introduction, General design features, Effective width method. Simply supported and cantilever Slab Bridge, analysis and design.	4L
Module-III: [3L] Box Culvert: Introduction, Design method and Design example.	3L
Module-IV: [4L] Beam and Slab Bridges: Introduction, Design of interior panel of slab. Pigeaud's method, Design of longitudinal girder, Calculation of longitudinal moment, design example.	4L
Module-V: [3L] Balanced Cantilever Bridges: General Features, Arrangement of supports, design features Articulation, Design example.	3L
Module-VI: [3L] Steel Bridges: General features, types of stress, Design example.	3L
Module-VII: [3L] Plate Girder Bridge: Elements, design, lateral bracing, Box-girder Bridges.	3L
Module-VIII: [6L] Composite Bridges: General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam.	6L
Module-IX: [6L] Cable Stayed Bridge: General features, Philosophy of design.	6L

Text/ReferenceBooks:

Name	Author	Publishers
Bridgeengineering	Krishnaraju	-
Principle&PracticeofBridgeEngineering	S.P.Bindra	DhanpatRaiPub
Essentialsofbridgeengineering	D.J.Victor	-
Bridgeengineering	Ponnuswamy	-
DesignofBridgeStructures	T.R.Jagadesh,M.A.Jayaram	-
Designofconcrete bridges	Aswani, Vizirani, Ratwani	-
Designofsteelstructures	Arya&Ajmani	-
ConcreteStructures	Vaziram&Ratwani	-
Structuresdesignanddrawing	Krishnamurthy	-
RelevantIS&IRCcodes	-	-

CO-POmapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	-	2	2	1	-	3	3	2	2	2	-
CO2	3	3	3	3	-	2	-	-	-	2	2	2	2	2	-
CO3	3	3	3	2	-	-	-	-	-	2	2	2	2	2	-
CO4	3	3	3	2	-	2	-	3	-	-	2	2	2	2	-
CO5	3	3	3	2	-	-	-	-	-	1	2	2	2	2	-

COURSENAME:PRESTRESSEDCONCRETEC
OURSECODE:CE802B
CONTACT:3:1:0
TOTALCONTACTHOURS:36HRSC
REDITS:3

Prerequisites:	
Basic understanding of R.C.C. design and analysis with fundamental knowledge of limit state behavior of R.C.C. with basic knowledge of structural analysis	
Text/Reference Books:	
Course Objective: Students will gain knowledge on pre-stressed concrete behavior analysis methods, stress calculation, losses, limit state design criteria and methods. student will be familiar with anchorage zone stress in post tension member. Basic knowledge on composite construction of pre-stressed and in situ concrete. Preliminary idea on partial pre-stressing and non-stressed reinforcement.	
Course Outcome:	
CO1: The student will get basic concept of pre-stressing materials and procedures. CO2: Detail understanding on losses in prestressed CO3: Become familiar with IS Codes on Prestressing. CO4: Understand design of various parts of a prestressed structure for many kind of loading. CO5: Detail idea on anchorage zone and composite members	
Course contents:	
Module-I: [6L] CO-PO mapping Introduction of Pre-stressed concrete: Materials, pre-stressing system, analysis of prestress and Bending stress, losses Shear and torsion al resistance: design of shear reinforcement, design of reinforcement for torsion Shear and bending Deflections of pre-stressed concrete members: Importance, factors, short term and long term Deflection	6L
Module-II: [6L] Limit state design criteria: Inadequacy of elastic and ultimate load method, criteria for limit states, strength and serviceability. Design of sections for flexure: methods by Lin and Magnel	6L
Module-III: [6L] Anchorage Zone stresses in post tensioned members: Stress distribution in end block, anchorage zone reinforcement	6L
Module-IV: [6L] Composite construction of pre-stressed and in-situ concrete: Types, analysis of stresses Statically Indeterminate structures: advantages of continuous member, effect of prestressing, methods of achieving continuity and method of analysis of secondary moments	6L
Module-V: [6L] Pre-stressed concrete poles and sleepers: Design of sections for compression and bending	6L
Module-VI: [6L] Partial pre-stressing and non pre-stressed reinforcement	6L

Name	Author	Publishers
Prestressed Concrete	N.KrishnaRaju	McGrawHill
DesignofPrestressedStructures	T.Y.LinandN.H.Burns	WileyEasternLtd
FundamentalsofPrestressed Concrete	N.C.Sinhaand S.K.Roy	-
Prestressed Concrete	S.Ramamurthan	-

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	-	-	-	1	-	-	-	-	-	2	2	-
CO 2	3	2	1	2	-	-	1	-	-	-	-	-	2	2	-
CO 3	-	2	1	-	1	3	1	-	-	-	-	-	2	2	-
CO 4	2	2	3	2	2	-	1	-	-	-	-	-	2	2	-
CO 5	2	2	1	2	2	-	1	-	-	-	-	-	2	2	-

COURSE NAME: AIR & NOISE POLLUTION & CONTROL CO URSE CODE: CE802C CONTACT: 3:0:0 TOTAL CONTACT HOURS: 36 HRSC REDITS: 3	
Pre requisites: Basic knowledge of environment pollution and its causes with preliminary knowledge of chemistry knowledge on different impurities are pollutants of air.	
Course Objective: Students will acquire knowledge on air pollution, sources and control of particulates, gaseous pollutant and self cleansing properties of the environment. Familiarity with noise pollution, measurement, sources and control. Acquire knowledge on global environmental issues like ozone depletion, acid rain, greenhouse effect. Familiarity with administrative control on environment with function of State and Central Pollution Control Boards and clearance process for industries and infrastructural projects. Some knowledge on environmental laws and Environmental Impact Assessment.	
Course Outcome: CO1: To learn about the air pollutants, sources and its effects. CO2: To have a clear understanding on the air quality standards and its techniques. CO3: To determine the fluid resistance for organic materials. CO4: To find the Properties of air pollution and its control measures. CO5: To learn about the effects and the sources of noise pollution.	
Course contents:	
Module-I: Introduction: Environment, Pollution, Pollution control	6L
Module-II: Air Pollution: Air Pollutants: Types, Sources, Effects; Air Pollution Meteorology: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.	6L
Module-III: Air pollution Control: Self cleansing properties of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles.	6L
Module-IV: Noise Pollution: Definition; Sound Pressure, Power and Intensity; Noise Measurement: Relationships among Pressure, Power and Intensity, Levels, Frequency Band, Decibel Addition, Measures of community Noise i.e. L_N , L_{eq} , L_{dn} , L_{NP} ; Sources, Effects; Control.	5L
Module-V: Global Environmental Issues: Ozone Depletion, Acid Rain, Global Warming-Green House Effects	4L
Module-VI: Administrative Control on Environment: Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects	5L

Module-VII: EnvironmentalLaws:WaterAct, AirAct,MotorVehicleAct															4L
Text/ReferenceBooks:															
Name					Author					Publishers					
EnvironmentalEngineering					S.K.Garg										
EnvironmentalEngineering					P.V.Rowe										
CO-POmapping															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	2	1	3	3	3	1	3	2	2	2	2	2
CO2	2	3	3	3	2	3	3	2	2	3	2	2	3	3	2
CO3	3	3	3	3	3	2	3	1	2	1	2	3	3	3	3
CO4	3	3	3	3	2	1	3	3	3	2	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	2	3	3	3	2	3

COURSENAME:PROJECT MANAGEMENT COURSECODE: CE803A CONTACT:3:0:0 TOTALCONTACTHOURS:36 HRS CREDITS: 3	
Pre requisites: 10+2	
Course Objective: Understand the basic concepts of project management. Appraise the project using appropriate appraisal techniques. Design and implement project by considering risk and its evaluation. Learn the process of project planning and execution.	
CourseOutcome: CO1: Learn the techniques of Mathematical and conceptual modeling of real life decision making problems, including the use of modelling and computational tools as well as analytic skills to evaluate the problems. CO2: Apply various models in real life case studies and learn about decision making. CO3: Develop decision making skills under challenging circumstances through the concept of optimization	
Coursecontents:	
Module-I: Introduction to Project Management: What is a project? Evolution of project management, the need of project management, Where is project management appropriate? Characteristics of projects, Characteristics of project management, Projects in contemporary organizations, Project life cycle.	6L
Module-II: Project Selection and Appraisal: Brainstorming and concept evolution, Project selection and evaluation, Selection criteria and models, Types of appraisals, SWOT analysis, Cash flow analysis, Payback period, and Net present value	6L
Module-III: Project Organization and Planning: Project manager, Cross-functional team, Dedicated project organization, Influence project organization, Matrix organization, Advantages and disadvantages of project organizations, Selection of project organization, Work Breakdown Structure (WBS), Integration of project organization and WBS, WBS and responsibility matrix.	6L
Module-IV: Project Scheduling and Resource Management: Gantt chart, Milestone chart, Network techniques: PERT and CPM, AON and AOA representation, Three time estimates, Using probability distributions for time computation, Probability of project completion, Time scale version of network, Early start and late start schedules, Resource allocation, Resource loading and leveling, Constrained resource scheduling, Multi-project scheduling and resource allocation, Crashing a project.	8L
Module-V: Computerized PM: Computerized PMIS, Choosing software for project management, using software for project management.	4L
Module-VI: Case Studies on Project Management: Modern cases in project management.	6L

Reference Books

1. Project Management for Business and technology: Principles and Practice, John M. Nicholas, Pearson Prentice Hall, New Delhi, 2005.
2. A Guide to the Project management Body of Knowledge (PMBOK Guide) 5 th Edition, PMI.
3. Project Management-Case Studies, Harold Kerzner, John Wiley & Sons, New Jersey, 2006.
4. Project and Production Management, A course by National Programme on Technology Enhanced Learning (NPTEL), Arun Kanda and S. G. Deshmukh, IIT Delhi, 2005.
5. Projects: Preparation, Appraisal, Budgeting and Implementation, Prasanna Chandra, Tata McGraw Hill Publishing Company Ltd., New Delh

CO-POmapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	3	2	1	2	2	3	2	3
CO2	3	3	1	2	3	2	1	1	2	3	1	3
CO3	3	3	2	2	3	3	3	3	1	1	2	3

COURSENAME:CYBER LAW AND ETHICS COURSECODE: CE803B CONTACT:3:0:0 TOTALCONTACTHOURS:36HRS CREDITS: 3	
Pre requisites: 10+2	
Course Objective: <ul style="list-style-type: none"> • To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession • To develop some ideas of the legal and practical aspects of their profession	
CourseOutcome: CO1: Understand the importance of professional practice, Law and Ethics in their personal lives and professional careers. CO2: Learn the rights and responsibilities as an employee, team member and aglobal citizen	
Coursecontents:	
Module-I: Introduction: Basics of Law, Understanding Cyber Space, Defining Cyber Laws, Scope and Jurisprudence, Concept of Jurisdiction, Cyber Jurisdiction, Overview of Indian Legal System, Introduction to IT Act 2000, Amendments in IT Act, Cyber Laws of EU – USA – Australia - Britain, other specific Cyber laws	6L
Module-II: Computer Ethics, Privacy and Legislation: Computer ethics, moral and legal issues, descriptive and normative claims, Professional Ethics, code of ethics and professional conduct. Privacy, Computers and privacy issue, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, Legal Policies, legislative background	6L
Module-III: Intellectual Property Rights Issues: Copyrights, Jurisdiction Issues and Copyright Infringement, Multimedia and Copyright issues, WIPO, Intellectual Property Rights, Understanding Patents, Understanding Trademarks, Trademarks in Internet, Domain name registration, Software Piracy, Legal Issues in Cyber Contracts, Authorship, Document Forgery	6L
Module-IV: Indian IT Act and Standards: Indian IT ACT, Adjudication under Indian IT ACT, IT Service Management Concept, IT Audit standards, ISO/IEC 27000 Series, COBIT, HIPPA, SOX, System audit, Information security audit, ISMS, SoA (Statement of Applicability), BCP (Business Continuity Plan), DR (Disaster Recovery), RA (Risk Analysis/Assessment)	8L
Module-V: International Laws governing Cyber Space: Introduction to International Cyber Law, UNCITRAL, Cyber Laws: Legal Issues and Challenges in India, Net neutrality, Role of INTERPOL	4L

Reference Books

1. Computer Ethics-Deborah G. Johnson, Pearsons Education
2. Cyber Law Simplified-VivekSood, McGraw Hill Education
3. Cyber frauds, cybercrimes & law in India- Pavan Duggal, Saakshar Law Publications
4. The Internet Law of India: Indian Law Series- Shubham Sinha, CreateSpace Independent Publishing Platform
5. Principles of Information Security- Michael E. Whitman, Herbert J. Mattord, Course Technology

CO-POmapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	3	2	1	2	2	3	2	3
CO2	3	3	1	2	3	2	1	1	2	3	1	3

COURSE NAME: PRINCIPLES OF MANAGEMENT

COURSE CODE: HU(CE)801

CONTACT: 2:0:0

TOTAL CONTACT HOURS: 24 HRS

CREDITS : 2

Course Objective:

To acquaint the students with the steps involved in the planning, implementation, scheduling and control of projects.

Course Outcomes:

At the end of this course student will demonstrate the ability to:

CO-1: To identify the resources needed for each stage, project development including involved stakeholders, tools and supplementary material

CO-2: To understand internal stakeholders with information regarding project costs by considering factors such as estimated cost, variances and profits

CO-3: To understand the time needed to successfully complete a project, considering factors such as task dependencies and task lengths

CO-4: To distinguish among the various tools for improving quality and how each should be used.

CO-5: To implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.

Course Content:

UNIT-I: Project Management Concepts Attributes of a Project, Project Life Cycle, The Project management Process, Global Project Management, Benefits of Project Management, Needs Identification.

2L

UNIT-II: Project Selection, Preparing a Request for Proposal, Soliciting Proposals, Project organization, the project as part of the functional organization, pure project organization, the matrix organization, mixed organizational systems.

4L

UNIT-III: Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure, project execution plan, work packaging plan, project procedure manual; project scheduling; bar charts, line of balance (LOB) and Network Techniques (PERT / CPM)/ Resource allocation, Crashing and Resource Sharing.

8L

UNIT-IV: Project Monitoring/Control and Project Performance: Planning, Monitoring and Control; Design of monitoring system; Computerized PMIS (Project Management Information System). Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control, Performance Indicators; Project Audit; Life Cycle, Responsibilities of Evaluator/ Auditor, Responsibilities of the Project Manager. Project Quality Management: Concept of Project Quality, TQM in Projects, Project Audit **6L**

UNIT-V: Cost Management estimating, budgeting, and controlling costs. **4L**

Reference Books:

1. Projects: Preparation, Appraisal, Budgeting and Implementation- Chandra, P. (2017). 8th Edition, Tata Mcgraw.
2. PERT & CPM principle and applications- L.S. Srinath , E.W.P. Ltd. New Delhi. 3. Network Analysis Techniques - S.K. Bhatnagar, Willey Eastern Ltd.
4. Project Management – K Nagrajan – New Age International Ltd.
5. Professional Construction Management Barrie-Paulson-McGraw Hill Institute Edition.
6. Project Management – Ahuja H.N. – John Wiely, New York.
7. Project Management-Planning and Control---Rory Burkey 4th ed.—Wiley, Ind
8. Text Book of Project Management, Macmillan- Gopalkrishnan P. and Rama Mmoorthy
9. Project Management for Business and Technology – Principles and Practice- Nicholas John M, Prentice Hall India, 2nd Edn.

CO-PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	-	2	3	3	3	2	3	2	2	2	2	-
CO 2	2	3	-	2	-	-	2	-	3	-	3	-	2	2	-
CO 3	2	-	3	2	-	3	-	-	2	-	3	-	2	2	-
CO 4	-	2	-	3	2	3	-	2	-	-	-	-	2	2	-
CO 5	2	-	-	-	3	2	-	-	2	-	3	-	2	2	-

COURSE NAME: MAJOR PROJECT-II

COURSE CODE: PR881

CONTACT: 0:0:12

CREDIT: 6

Course Contents:

It is intended to start the project work early in the seventh semester. The project problem is expected to be completed in the seventh semester and the demonstration and report writing will be carried out in the eighth semester. The students in a group of 4 to 6 work on a topic are to be approved by the head of the department under the guidance of a faculty member. The students prepare a comprehensive project report after completing the work to the satisfaction of the supervisor to be submitted at the end of the semester. The progress of the project is evaluated by a committee may be constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report may jointly by external and internal examiners constituted by the Head of the Department.

COURSE NAME: GRAND VIVA

COURSE CODE: CE882

CREDIT: 1

Course Contents

The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and all Faculty members of the department. The Comprehensive Viva-Voce is intended to assess the student's understanding of the courses he/ she studied during the 4 years B. Tech. programme.