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]

		1st Year 1st Semester							
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

1st Year 2nd 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

2nd Year 3rd 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

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

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.

3rd Year 5th 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 B. Surveying & Geomatics Application of IOT in civil engineering	4	0	0	4	4
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

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

3rd Year 6th 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 B. Human Resource Management C. Studies On Six Sigma	4	0	0	4	4
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.

4th Year 7th 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 Advanced Foundation Engineering Pavement Design	3	0	0	3	3
3	ENGG	Major	CE703	A. Water and Wastewater Engineering B. Hydraulic Structure C. Water Pollution and its Control	3	0	0	3	3
4	SCI	Minor	CE704	A. Human Resource Development and Organizational Behavior B. History of Science & Engineering C. Finite Element Method	3	0	0	3	3
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.

4th Year 8th 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 B. Public Transport System C. Ground Improvement Techniques	3	0	0	3	3
2	ENGG	Major	CE802	A. Bridge Engineering B. Pre-stressed Concrete C. Air & Noise Pollution and Control	3	0	0	3	3
3	ENGG	Minor	CE803	A. Project Management B. Cyber Law and Ethics	3	0	0	3	3
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.

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**

Department: Civil Engineering

Curriculum Structure & Syllabusfor BTech in Civil Engineering (Effective from 2023-24 admission batch)

		1st Year 1st Semester							
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
Total of Theory and Practical Courses								29	22

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

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 science at the 10+2 levels in schools. Technology is being increasinglybased on the basics of Civil Engineering, broad area 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, walter 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 stones 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 housc

	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
PAPER CODE: 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: MaGrawhill)

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 & Subhramanium, (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

COURSE CODE: M(CE)101
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36
CREDITS: 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 $t\,f\,(t)$, LT of $\frac{f\,(t)}{t}$, LT of

derivatives of $f(t)$, LT of integral of $f(t)$, Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties, Convolution theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT.

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-I, New age International Publishers
7. Samanta Guruprasad, A text book of Engineering Mathematics-II, New age International Publishers

Reference Books:

1. Bronson, R., Schaum's Outline of Matrix Operations. 1988.
2. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969
3. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

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

COURSE NAME: BASIC ELECTRICAL ENGINEERING
COURSE CODE: 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.

COURSE OBJECTIVE:

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

COURSE OUTCOMES (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. Teraja, 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 andT.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",TataMcGrawHill,2010.
2. T.K. Nagsarkar, M.S.Sukhija,"Basic Electrical Engineering",Oxford Higher Education.
3. Hughes,"Electrical and ElectronicTechnology",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,McGrawHill.
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

COURSE NAME: ENVIRONMENTAL SCIENCE

COURSE CODE: 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
CO4	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

C0 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-2 **3L**

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-3 **3L**

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-4 **3L**

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:

CO \ PO	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 acquainted 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 develops the fundamental skills of industrialdrawings.
CO3: Apply the concept of engineering scales, dimensioning and various geometric curvesnecessary to understand design of machine elements.
CO4: Analyse the concept of projection of line, surface and solids to create the knowledge baseof 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; SectionalViews; 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 ofthe sectioned surface, Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw sectional orthographic views of objects from industry and dwellings (foundation to slab only).

Computer Graphics: **3P**

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modeling; Solid Modeling.

Module 4: Overview of Computer Graphics **3P**

Demonstration of CAD software [The Menu System, Toolbars (Standard, Properties, Draw,

Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Zooming methods, Select and erase objects].

Module 5: CAD Drawing, Customization, Annotations, layering 6P

Set up of drawing page including scale settings, ISO and ANSI standards for dimensioning and tolerance; Using various methods to draw straight lines, circles, applying dimensions and annotations to drawings; Setting up and use of Layers, changing line lengths (extend/lengthen); Drawing sectional views of solids; Drawing annotation, CAD modeling of parts and assemblies with animation, Parametric and nonparametric solid, surface and wireframe modeling, Part editing and printing documents.

Module 6: Demonstration of a simple team design project 3P

Illustrating Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed topologies for engineering analysis and tool-path generation for component manufacture, use of solid-modeling software for creating associative models at the component and assembly levels.

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House
2. K. Venugopal, Engineering Drawing + AutoCAD, New Age International publishers

Reference Books:

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, KhannaPublishing House
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

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	2			2									2	2	2
CO2	2			2									2	2	2
CO3	3			2									2	2	2
CO4	3			3									3	3	2
CO5	3	2		3	2								3	3	2

COURSE NAME: ENGINEERING PHYSICS LAB
COURSE CODE: 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: BASIC ELECTRICAL 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

Course Objectives:

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

Pre requisites: 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 throughPower Point presentation.
CO2	Able demonstrate interpersonal skills through Group Discussion both fororganizational 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 developmentprograms.
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-PO mapping

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
COURSE CODE: 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-PO mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	3	2	1	2	3	3	3	3
C02	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

1st Year 2nd 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
Total of Theory and Practical Courses								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 tom 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 EngineeringMechanics:** 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 ofJoints; 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 andCentre 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 ofInertia:** Area 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 inertia of circular plate, Cylinder, Cone, Sphere, Hook, Problems.	**4**

Module 6:	**Virtual Workand 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. Applications of energy method for equilibrium. Stability of equilibrium, Problems.	**3**
Module 7:	**Review ofparticle 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**
Module8:	**Introduction toKinetics of Rigid Bodies:** Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simpleproblems; 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**

Text books:

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. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, PearsonPress.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford UniversityPress
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education

Reference books:

1. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer's Engineering Mechanics
2. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications
3. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
4. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

CO – PO/PSO Mapping:

COS	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO 2	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CO 3	3	2	3	2	-	-	-	-	-	-	-	-	2	1	-
CO 4	3	3	3	3	-	-	-	-	-	-	-	-	1	2	-
CO5	3	3	3	3	-	-	-	-	-	-	-	-	1	2	-
CO6	3	2	3	2	-	-	-	-	-	-	-	-	2	1	-

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, MsGraw 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) level of knowledge of English grammar, vocabulary reading and writing skills.
Course Objectives	The course aims to impart domain and industry-specific communication skills in a globalized context and to promote the understanding of business communication practices and cross cultural dynamics.
Course Outcomes:	By pursuing this course the students shall be able to
	CO1. Define, describe and classify the modalities and nuances ofcommunication 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:

Module 1:
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

Module 2:
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

Module 3: 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

Module 4: 4L
Report Writing

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

Module 5:
Employment Communication

a. Writing Business Letters (Enquiry, Order, Sales, Complaint, Adjustment, Job Application, Offer) 2**L**

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: TataMcGraw-

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. Roultedge Press. (GDGE)

2. Molyneux and Razavi. (2002). Gender Justice, Development and Rights. Oxford University Press (GJDR or WGD)

3. Visvanathan, Duggan,Wiegersma 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 Fe_2O_3 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
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

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 Plain, Chisels etc.
CO3: Apply and performing 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 in Welding and apply various machining processes which give alot 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 - Machine shop **6P**

Typical jobs that may be made in this practice module:
i. To make a pin from a mild steel rod in a lathe.
ii. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / ormilling machine.

Module 2 - Fitting shop **6P**

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

Module 3 – Carpentry Shop **6P**

Typical jobs 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 jobs that may be made in this practice module:
i. Arc Welding: To join two thick (approx 5mm) MS plates by manual metal arc welding.

ii. Gas Welding: To join two thin mild steel plates or sheets by gas welding.
iii. House wiring, soft Soldering

Module 5 – Smithy & Casting **6P**

Typical jobs 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 green sand moulds to prepare, and a casting be demonstrated.

Module 6 – CNC Machining & Laser Cutting **6P**

Typical jobs 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, utilizing one or more ofthe techniques covered above.

Text Books:

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

Reference Books:

1. Gowri P., Hariharan and A. Suresh Babu, ManufacturingTechnology – I, Pearson Education, 2008.
2. Roy A. Lindberg, –Processes and Materials of Manufacture‖, 4th edition, Prentice Hall India, 1998.
3. Kalpakjian S. and Steven S. Schmid, ManufacturingEngineering 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

2nd Year 3rd 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

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

COURSE NAME: SURVEYING
COURSE CODE: CE301
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS: 3

Pre requisites: Student 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 period 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, Adjustments 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 ofLocating 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*:*

Sl No	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	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

Pre requisites: No Pre-Requisite required (NPR)

Course Objective: The objective of this course is 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 summaries basic knowledge about various kind 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	summaries 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. Fly ash 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, Limemortar, 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, covering power of paints, Painting: Plastered surfaces, painting wood, surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish, French Polish, Wax Polish. **Miscellaneous Materials**: Gypsum: Classification, Plaster of Paris, Heat and sound insulating materials, Geo-synthetics [2L+1T]

Module -3: [9L]

Foundations: Function of Foundations, Essential requirement of good foundation, Different types 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 and half brick thick wall). Cavity wall [2L+1T]

Wall, Doors and Windows: Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal [2L+1T]

Module -4 [9L]

Stairs: Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case, Elevation and cross section of different type of stair cases. [2L+1T]

Flooring: Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing [2L+1T]

Plastering and Pointing: Plastering with cement mortar, Defects in plastering, pointing, white washing, 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 , Roof Covering materials: AC sheets GI sheet [2L+1T]

Text / Reference Books:

Sl no	Name	Author	Publisher
1	Building Materials	S.K. Duggal	
2	Building Materials	P.C. Varghese	PHI
3	Engineering Materials	S.C. Rangwala	
4	Concrete Technology	M. S. Shetty	
5	Concrete Technology[	A.M. Nevile & J.J. Brooks	Pearson Education
6	Building Construction	B.C. PUNMIA	

CO-PO mapping

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

COURSE NAME: STRNGTH OF MATERIALS

COURSE CODE: CE 303
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS: 3

Pre requisites: Student 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 homogenous, 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 andbrittle 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 ofgravity [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 circleof stresses, construction of Mohr's circle, applications. [4L+2T]

Module-4: [11L]

Introduction to thin cylindrical & spherical shells: Hoop stress and meridonial - 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:

Sl No	Name	Author	Publisher
1	Elements of Strength of Material	S. P. Timoshenko & D.H.	EWP Pvt. 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 S Bhavikatti	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

COURSE NAME: ENGINEERING GEOLOGY
COURSE CODE: CE304
CONTACT: 2:0:0
TOTAL CONTACT HOURS: 24HRS
CREDITS: 3

Pre requisites: Basic knowledge of Geography & Earth Science

Course Objective:
To make the students knowledgeable to understand, apply and explore Geological parameters,Rock and other materials and activity related to earth science.

Course Outcome:

CO1	Students will have knowledge about Engineering properties of Rocks and their Minerals.
CO2	Student will be appraised about Dam, reservoir, tunnel
CO3	Student will understand about Earthquake phenomena.
CO4	Student will able to carry out Physical exploration
CO5	Student will able to estimate various geological parameters by use of modern tools & techniques

COURSE CONTENTS:

Module-1: [2L+1T]

Geology and its importance in Civil Engineering

Module-2: [2L+1T]

Mineralogy: Definition, internal and external structure of minerals, Classification and physicalproperties of minerals.

Module-3: [2L+1T]

Classification of rocks:

a) Igneous rocks: Origin, mode of occurrence, forms & texture, classification and engineeringimportance.

b) Sedimentary rocks: Process of sedimentation, classification and engineering importance.
c) Metamorphic rocks: Agents and types of metamorphism, classification and engineeringimportance.

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 CivilEngineering.

Module-7: [2L+1T]

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

Module-8: [2L+1T]

Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strengthand 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 methodfield procedure –sounding and profiling, electrode configuration, interpretation of resistivitydata. Geophysical surveys in ground water and other Civil Engg. Projects.

Module-11: [2L+1T]

Applied Geology: Surface and subsurface geological and geophysical investigations in majorCivil 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 / Reference Books:

Sl no	Name	Author	Publisher
1	Engineering and General Geology	Parvin Singh	Katson 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	Wileyeastern Prentice-Hall, U.S.A.
5	Ground Water hydrology	Todd D.K.	John Wiley & Sons, Second edition, 1980.

CO-PO mapping

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
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:

CO1	Understand and differentiate among different programming languages for problem solving.
CO2	Describe the way of execution and debug programs in C language.
CO3	Define, select, and compare data types, loops, functions to solve mathematical and scientific problem.
CO4	Understand the dynamic behavior of memory by the use of pointers.
CO5	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 singed magnitude singed 1‘s complement system and signed 2‘s complement system. Arithmetic– Addition and Subtraction (using1‘scomplementand2‘scomplement). 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 characterse identifiers And keywords, data type & sizes, variable names, declaration, statements. Operators & Expressions: Arithmetic operators,relational operators, logical operators, increment anddecrementoperators,bitwiseoperators,assignmentoperators,conditionaloperators,specialoperators-typeconversion, C expressions, precedence and associativity. Input and Output: Standard input and output, formatted output–print f,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 go to 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 class, scope rules and life time of variables C pre-processor: Pre-processing directive and macro, parameterized macro.	**4**

5. Array and Pointer	Arrays: One dimensional arrays, Two-dimensional arrays, Passing an array to a function Pointers: Pointers, Pointer and Array, Pointer and functions. Strings: Character array and string, array of strings, Passing a string to a function, String related functions, Pointer and String. Dynamic memory allocation: Malloc, calloc, realloc and free with example.	**7**
6. Structures, Unions and Enum	Basic of structures, arrays of structures, structures and pointers, bit fields. Basics of union and enum, difference between structure and union.	**3**
7. File in C	Files handling- opening and closing a file in different mode, formatted and unformatted files, Command line arguments, f open, f close, f get c, f put c, f print f, f scan f function	**3**
	Total Contact Hours	**36**

Textbook:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. KanetkarY.-LetusC,BPBPublication,15th Edition

Reference Books:

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

CO–PO/PSO Mapping:

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
CO1	3	3	3	2	2								**3**	**3**	**3**
CO2	3	2	2	2	2								3	3	3
CO3	3	3	3	2	2								3	3	3
CO4	3	3	3	2	2								3	3	3
CO5	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; Matricespolymer, 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 platesequilibrium 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 welding, 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

COURSE NAME: SURVEYING LAB

COURSE CODE: CE 391
CONTACT: 0:0:3
CREDITS : 1.50

Pre requisites: Student should have knowledge about the basic Basic Survey Theory

Course Objective: Student will be able to to function as a member of a team and Havethe 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:

Chain surveying

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 bychain and compass, Chain and compass traverse

Plane Table survey

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

Leveling

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

Contouring:

Direct contouring, Indirect contouring(Method of Interpolation).

Theodolite Traversing byusing Theodolite. Measurements of Horizontal & Vertical angles.

Circular Curves- Setting outof Simple Circular Curves.

Text / Reference Books:

Sl No.	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

Pre requisites: Student should have the knowledge about Engineering geology theory.
Course Objective:
To make the students capable to identify and study properties of rock and minerals.
They alsoshould be able to use modern tools line microscope.

Course Outcome:

CO1	Student should acquire knowledge about engg. Properties of rocks and their minerals.
CO2	Student should be able to identify rocks and minerals
CO3	Student should be able to use modern tools live microscope to explore samples.
CO4	Student 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 structuresThickness problems, Borehole problems

Text / Reference Books:

Sl no	Name	Author	Publisher
1	Engineering and General Geology	Parvin Singh	Katson publishing house Delhi 1987
2	Engineering Geology for CivilEngineers	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, Secondedition,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	-

COURSE NAME: COMPUTER FUNDAMENTALS AND PROGRAMMING LAB

COURSE CODE: 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.

Course Content:

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 Code block.

Module-2: Problem based on

a) Basic data types
b) Different arithmetic operators.
c) Print f( ) and scan f( ) 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 I-Dand2-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. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Kanetkar Y.- Letus C, BPB Publication,15th Edition

Reference Books:

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

CO-PO/PSO Mapping:

CO PO	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	3	3	3								3	3	3
CO2	3	3	2	3	3								3	3	3
CO3	3	3	3	3	3								3	3	3
CO4	3	3	3	3	3								3	3	3
CO5	3	3	3	3	3								3	3	3

COURSE NAME: BUILDING PLANNING AND DRAWING LAB
COURSE CODE: CE393
CONTACT: 0:0:2
CREDITS: 1.0

Pre requisites: Student should have knowledge about building materials and construction andalso mathematics

Course Objective: The objective of this course is to make student able to Learn to sketch and take field dimensions and to take data and transform it into graphic drawings and Auto Cad skills.

Course Outcome:

CO1 Prepare simple layout of buildings.
CO2 Produce working drawings for individual components like doors and windows etc.
CO3 Develop line diagram, building section, elevation, key plan and sectional elevation.
CO4 Illustrate hand drafting any parts of a building and implement the regulations for layout of plan.

LIST OF EXPERIMENT:

Foundations - Spread foundation for walls and columns; Footing for a RCC column, raft and pile foundations

Doors and Windows - Glazed and paneled doors of standard sizes; Glazed and paneled windows of standard sizes; special windows and ventilators

Stairs- Proportioning and design of a dog-legged, open well RCC stair case for an office / Residential building; Details of reinforcements for RCC stair cases; Plan and elevation of straight run, quarter turn, dog-legged and open well staircases.

Roofs - Types of sloping roof, lean-to roofs, RCC roof with details of reinforcements

Trusses - King post and Queen post trusses.

Functional Design of Buildings -To draw the line diagram, plan, elevation and section of the following: Residential Buildings (flat & pitched roofs), Office Buildings (flat roof), School.The designs must show positions of various components including lift well and their sizes. Introduction to drawing by using software package.

Text / Reference Books:

Sl No	Title	Author
1	Principles of Building Drawing	Shah & Kale
2	Text Book of Building Construction	Sharma & Kaul
3	Building Construction	B C Punmia
4	Civil engineering drawing	M.Chakrabory

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	**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**	**-**

COURSE NAME: LIFE SKILL
COURSE CODE: 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	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
COURSE CODE: CE 401
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: Student should have knowledge about the building materials and construction.

Course Objective: The objective of this course is to produce knowledge to the student ingredients of concrete, specific

Course Outcome:

CO1	Identify the functional role of ingredients of concrete
CO2	Student 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 freshand hardened properties of concrete
CO5	Student will be able to design ordinary and control concretes, replacement of cement and their specific applications

Course contents:

Module-1: [6L] ***Introduction:-*** Concrete as a Structural Material, Good Concrete Manufacture of Portland Cement, Chemical Composition of Cement, Hydration of Cement, Heat ofHydration [4L]	**6L**
Module-2: [9L] ***Types of Cement***:– 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] ***Water &Aggregates***– Classification, Mechanical and Physical Properties, Deletarious Substances, Alkali-Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modules, Grading Requirements. Testing of Aggregates – Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impactm Value, Abrasian Value.Quality of Water – Mixing Water, Curing Water, Harmful Contents.[3L]	**9L**

Module-3: [11L] **11L**

Properties of Fresh Concrete– 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]

Strength & durability of Concrete– 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,

Cylinders, Non-Destructive Tests. [3L]

Module-4: [10L] **10L**

Permeability of concrete,Chloride & Sulphate attack on concrete, carbonation of concrete [2L]

Admixtures – different types (chemical and mineral), effects, uses, Retarders and Super plasticizers. Mix Design by I.S. 10262(2009) Code method. [4L]

Special concrete: Light-weight, Polymer and Fiber-reinforced concrete. [2L]

Text / Reference Books:

SL NO	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	Text book of Concrete Technology	P.D. Kulkarni	Tata McGraw Hill

CO-PO mapping :

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

COURSE NAME: STRUCTURAL ANALYSIS
COURSE CODE: CE 402
CONTACT: 4:0:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS : 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:

Module-1: [3L] Determination of stability of any type of structure, Determinate and Indeterminate structures, Degree of indeterminacy for different types of structures: Beams, Frames,Trusses.	**3L**
Module-2: [6L] Analysis of determinate structures: Portal frames, arches.	**6L**
Module-3: [6L] ***Strain energy:***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**
Module-4: [6L] ***Deflection of determinate structures:***Moment area and Conjugate beam method, Energy methods,Unit load method for beams, Deflection of trusses and simple portal frames	**6L**
Module-5: [6L] ***Influence line diagrams***: Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears.	**6L**
Module-6: [3L] ***Analysis of statically Indeterminate beams:*** Theorem of three moments. Energy Method, Force Method, Analysis of two hinged arch.	**3L**
MODULE –7: [6L] ***Analysis of statically indeterminate structures:*** Moment distribution method, Slope Deflection Method, Approximate method of analysis of structures-portal and cantilever method.	**6L**

Text / Reference Books:

Sl no	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	StructuralAnalysis (Vol I& Vol II)	S S Bhavikatti	Vikas Publishing House Pvt. Ltd
5	Structural Analysis	Ramammurtham	
6	Structures	Schodek & M. Bechhold	Pearson Education

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	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

Pre requisites: 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:

CO1	Identify the fundamental differences in engineering behavior between cohesiveand cohesion less soils
CO2	Compute the groundwater seepage and distribution of groundwater pressure.
CO3	Calculate the applied stress beneath the ground surface.
CO4	Demonstrate that you know the fundamental difference in the strength anddeformation characteristics of cohesive and cohesion less soils.
CO5	Analyze field and laboratory data to determine the strength and deformationproperties of cohesive and cohesion less soils.
CO6	Determine settlements due to consolidation of soil

Course contents:

Module-I: [4L+1T] ***Origin & formation of Soil:-***Types, Typical Indian Soil, Fundamental of SoilStructure, Clay Mineralogy. [2L] ***Soil as a Three Phase System :-***Weight- Volume Relationship, Measurement of Physical Properties of Soil: Insitu Density, Moisture Content, Specific Gravity, Relative Density.[2L+1T]	**5L**
Module-II: [6L+1T] ***Particle Size Distribution :-***By Sieving, Sedimentation Analysis. [2L] ***Index Properties of Soil***:- Attarbergs Limits- Determination of Index Properties of Soil by Casagrandes Apparatus, Cone Penetrometer,Soil Indices.[2L] ***Soil Classification :-***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] ***Soil Moisture :-***Darcy,s Law, Capillarity in Soil, Permeability, Determination of Coefficient of Permeability of Soil in Laboratory, Permeability for Stratified Deposits.[2L+1T] ***Effective Stress Principles***:- 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]	

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]	**6L**
Module-V: [6L+3T] **Compressibility & Consolidation of Soil: -** Terzaghi's Theory of One Dimensional Consolidation, CompressibilityCharacteristics of Soils, Compression Index, Coefficient of Compressibility & Volume change, Coefficient of Consolidation, Degree & rate of Consolidation, Consolidemeter & 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]	**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 EasternLtd
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	PO 1	PO2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	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	PO 8	PO9	PO 10	PO 11	P1 2	PS O1	PS O2	PS O3
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

Pre requisites: Student 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	Student should be able to test of different concrete property to specify quality of concrete
CO4	Student shall learn to work in a team to achieve the objective

LIST OF EXPERIMENT:

Tests on cement –specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar Cubes.
Tests on fine aggregate –specific gravity, bulking sieve analysis, fineness modulus, moisture content, bulk density, voids and Deleterious materials.
Tests on coarse aggregate-specific gravity, sieve analysis, fineness modulus, bulk density and voids.
Tests on Fresh Concrete: Workability : Slump, Vee-Bee, Compaction factor tests
Tests 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 , Non destructive testing (Rebound hammer & Ultrasonic pulse velocity)
Mix Design-As per IS 10262(2009) method

Text / Reference Books:

SL NO	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	Text book of Concrete Technology	P.D. Kulkarni	Tata McGraw Hill

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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 – I
COURSE CODE: CE 492
CONTACT: 0:0:3
CREDITS : 1.50

Pre requisites: Student 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 indentify 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 soil 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) Cohesion less ii) cohesivesoil
3. Determination of In situ density by core cutter method & sand replacementmethod.
4. Grain size distribution of cohessionless soil by sieving & fine-grained soil by hydrometer analysis.
5. Determination of Atterberg's limits (liquid limit, plastic limit & shrinkagelimit).
6. Determination of co- efficient of permeability by constant head permeameter (coarse grained soil) & variable head permeameter (fine grainedsoil).
7. Determination of compaction characteristics of soil.

Reference

1. Soil Testing by T.W. Lamb (John willey)
2. SP-36 (Part-I & Part-II)
3. Measurement of Engineering properties of soil by E. Saibaba Reddy & K. Rama sastri.(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: Student should have knowledge about building construction and material details.

Course Objective: The objective of this course is to give the students basics 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 ofworks.
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, Septictank

Unit II: Analysis and schedule of rates for Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring andFinishing.

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 andvarnishing

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, valuationtable.

Text / Reference Books:

B. N. Datta, Costing, Estimation and Valuation, UBSPublication
S. C. Rangwala, Estimating & Costing (Civil Engg.), CharotarPublication
G. S. Birdie, A text book of Estimating & Costing, Dhanpat Rai &Sons
S. C. Rangwala, Valuation of Real properties, CharotarPublication
Estimating, Costing, Specification & Valuation In Civil Engineering byM.chakrabory

CO-PO mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	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**	**-**

COURSE NAME: NUMERICAL METHODS LAB

COURSE CODE: CS(CE)491
CONTACT: 0:0:3
CREDITS : 1.50

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

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

Course Outcome (CO):
On successful completion of the learning sessions 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 skills 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. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments 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:

PO / CO	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 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).

3rd Year 5th 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 E. Surveying & Geomatics Application of IOT in civil engineering	4	0	0	4	4
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

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

COURSE NAME: STRUCTURAL DESIGN – I
COURSE CODE: CE 501
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: Student should have knowledge about how to solve analysis of structural problem.

Course Objective:

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 concretemembers.

Course Outcome:

CO1 : Exhibit the knowledge of concrete design philosophies, by working and limit state methodology
CO2 : Design the structural details of beam and slab
CO3 : Design the structural details of column.
CO4 : : Design the structural details 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: 456 2000)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: 456 2000) 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 doglegged 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 SP 16.	**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 / Reference Books:

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	Ashok K. 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-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
COURSE CODE: CE 502
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: Student 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 & Coulombs 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 bulk heads, coffer dam structures 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 stabilityanalysis.	**4L**
Module-4: **Site Investigation & Soil Exploration:**Planning of sub-surface explanation, methods, sampling, samples, Insitu 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 1S 6403	**4L**
Module-6: **Settlement analysis of shallow foundation:**Immediate and consolidation settlement, correction for rigidity and dimensional effects, settlement in various, types of soil, IS-1904 and 8009 recommendations, Allowable bearing capacity	**4L**

Module-7: **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.	**8L**

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	Willes EasternLtd
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	PSO1	PSO2	PSO3
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 HRS
CREDITS: 3

Pre requisites: Knowledge on IRC codes, Loading pattern base 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	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	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. Wastewater Treatment: Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic	**3L**

Tank.

Text / Reference Books:

Sl no	Name	Author	Publishers
1	Environmental Engineering	S.K .Garg,	Khanna Publishers
2	Water Supply, Waste Disposal and Environmental Pollution Engineering	A.K.Chatterjee	Khanna Publishers.
3	Environmental Engineering, Vol.II	P. N. Modi	-
4	Environmental Modelling	Rajagopalan	Oxford University Press.
5	Environmental Engineering	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
COURSE CODE: CE505A
CONTACT: 4:0:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS: 4

Pre requisites: Knowledge on practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems.

Course Objective:

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.

Course Outcome:

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

Course contents:

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, Inclinometer, 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 / Reference Books:

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-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: SURVEYING & GEOMATICS
COURSE CODE: CE505B
CONTACT: 4:0:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS: 4

Pre requisites: Knowledge on practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems.

Course Objective:

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.

Course Outcome:

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.

Course contents:

Module-I: Introduction to Surveying: Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and it 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 SystemsSegments, 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 / Reference Books:

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-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: APPLICATION OF IOT IN CIVIL ENGINEERING
COURSE CODE: CE505C
CONTACT: 4:0:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS: 4

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

Course Objective:

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.

Course Outcomes:

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 / Reference Books:

1. ArshdeepBahga, Vijay Madisetti, “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-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

COURSE NAME: SOIL MECHANICS LAB-II
COURSE CODE: CE 591
CONTACT: 0:0:3
CREDITS : 1.50

Pre requisites: 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 familier with fractional test standard penetration test.

Course Outcome:

CO1: Ability to caculate 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 determing 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 Willey)
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

COURSE NAME: HIGHWAY & TRANSPORTATION ENGINEERING LAB
COURSE CODE: CE592
CONTACT: 0:0:3
CREDITS : 1.50

Pre requisites: 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. mixdesign 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: Student 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 seal surfacing 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
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 laboratorial results
CO4: Apply the laboratorial 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	CHEMICAL
4.	Determination of concentration of Chlorides in a given sample of water	
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
COURSE CODE: PR591
CONTACT HOUR: 0:0:2
CREDITS: 1

Prerequisite: Fundamentals of Civil Engineering.
Course Contents:
i) literature review on topic of interest.
ii) Finding research Gaps
iii) Attempt to solve problems towards filling the research gaps.

3rd Year 6th 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 B. Human Resource Management C. Studies On Six Sigma	4	0	0	4	4
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 behaviorunder 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 Stipullation 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.	**6L**
IS 800 – 2007 to be followed for all IS code provisions.	

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	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	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 endovers.
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, Arbritation, 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	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	**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**	**-**

COURSE NAME: IRRIGATION AND WATER RESOURCE ENGINEERING
COURSE CODE: CE603
CONTACT: 4:0:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS : 4

Prerequisite: Introduction to Fluid Mechanics in Civil Engineering.

Course Outcome:

CO1. The Student should Understand the fundamentals of flow in open channels.
CO2.TheStudentswilllearntheconceptsofirrigation.
CO3. The student should understand estimating the different water requirement of different types of crops
CO4. The student should learn the design of irrigation channels soil conservation, flood control and other watermanagementprojects.
CO5. The Student should understand about groundwater resources, aquifers and wells.

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.

Course Contents

Module 1 History of hydrology, Measurement of Rainfall, Rain gauges, Estimation of missing Rainfall data, Checking of consistency, Optimum number of Rain gauges. Calculation of average rainfallover 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**
Module 2 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**
Module 4 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 andDrip irrigation. Examples.	**6L**

Module 5 Irrigation canals: design principles of irrigation canals, navigation canals and drainage canals. Design of unlined alluvial channels by silt theories: Introduction, Sediment Load, Suspended load and its measurement, Bed load and its measurement, Kennedy's theory, procedure for design of channel by Kennedy's method, Lacey's theory, design procedure by Lacey's theory, Cross section of an irrigation canal, balancing depth. Example.	**8L**
Module 6 Lining of Irrigation canals: Objectives, advantages and disadvantages of canal lining, economics and requirement of canal lining. Water logging and drainage: causes, Effects and prevention of water logging. Types of open drains and closed drains, canal outlets, land reclamation. Example.	**4L**

Text / Reference Books:

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

CO-PO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	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
COURSE CODE: CE604A
CONTACT: 4:0:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS : 4

Pre requisites: 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 optimisation 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 decisionmaking 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 x n or m x 2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queing 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 / Reference Books:

Name	Author	Publishers
Operations Research	Wayne L	Thomson Learning,2003.
Operations Research-An Introduction	Hamdy H. Taha	Pearson Education,2003
Operations Research	R. Panneer Seevam	PHI Learning, 2008
Total Quality Management	V.K.Khanna	New Age International, 2008
Linear Programming and Theory of Games	P. M. Karak	ABS Publishing House
Linear Programming and Theory of Games	Ghosh and Chakraborty	Central Book Agency
Operations Research	M. V. Durga Prasad	CENGAGE Learning

CO-PO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	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 HRS
CREDITS : 4

Pre requisites: 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 work force, 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 Labout 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 / Reference Books:

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	PO10	PO11	PO12	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 HRS
CREDITS : 4

Pre requisites: Basic concepts of Management and Planning

Course Objective:

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 skills 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, Central Limit Theorem, Hypothesis Testing, Confidence Intervals, Analysis of Variance (ANOVA)	
Module 9: Improve Phase: Simple linear Regression, Correlation, Regression Equations, Residual analysis, Multiple and Non- linear regression, Data transformation, Box Cox.	**4L**
Module 10: The Control Phase: Lean Controls, Control Methods for 5S, Kanban, Poka – Yoka (Mistake Proofing), Statistical process Control (SPC), Data collection of SPC, Six Sigma Control Plans, Cost benefit analysis, Elements of control Plan, Elements of Response Plan.	**4L**

Text / Reference Books:

Name	Author	Publishers
Simplified six sigma methodology tools and implementation	N. Gopala Krishnan	PHI
Eight steps to problem solving- six sigma	Mohit Sharma	Zorba Books
Six Sigma Handbook	PYZBEK	-
ASQ Certified Six Sigma Handbook	American Society of Quality	-

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	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: CE 691
CONTACT: 0:0:3
CREDITS : 1.50

Pre requisites: Student should knowledge about rcc and steel structure design of various structural components and building structure.

Course Objective: Student 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 condition 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 i) simply supported R.C.C Beam ii) Continuous T- Beam
CO3: Student 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 multistoried 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 i) simply supported R.C.C Beam ii) Continuous T- Beam.
3. Design & Detailing of columns, isolated and combined footing
4. Design & detailing of a i) 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 multistoried 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 IS875
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 bracings, 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
Reinforeced cement concrete design- Nilam shrama
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	PO2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
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

COURSE NAME: COMPUTER AIDED DESIGN & DRAFTING LAB
COURSE CODE: CE 692
CONTACT: 0:0:2
CREDITS : 1.00

Pre requisites: 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 multistoried 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 usingSTAAD Prp V8i with
   Indian Example: Static and Dynamic Methods – T.S.Sharma – Educreation Publishing
2. Exploring Bentley STAAD Pro
   CONNECT Edition - - Prof. Sham Tickoo Purdue Univ. – Cadcim Technologies
3. Analysis and Design of Structures:
   A Practical Guide to Modelling – D. Trevor Jones – Bentley

CO-PO mapping:

	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	1	3	1	1	1	3	3	1	3	3	3	3
CO 2	3	3	3	1	2	2	1	-	2	2	2	3	3	3	3
CO 3	3	3	3	1	3	2	2	-	3	3	2	3	3	3	3
CO 4	2	2	2	1	2	2	1	2	3	2	2	3	3	3	3
CO 5	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.

4th Year 7th 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 Advanced Foundation Engineering Pavement Design	3	0	0	3	3
3	ENGG	Major	CE703	D. Water and Wastewater Engineering E. Hydraulic Structure F. Water Pollution and its Control	3	0	0	3	3
4	SCI	Minor	CE704	D. Human Resource Development and Organizational Behavior E. History of Science & Engineering F. Finite Element Method	3	0	0	3	3
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
COURSE CODE: CE701
CONTACT: 3:1:0
TOTAL CONTACT HOURS: 48 HRS
CREDITS : 4

Pre requisites: Basic knowledge of on 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 location 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 : Learnn 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 : Location 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 / Reference Books:

Name	Author	Publishers
Transportation Engineering	Vazirani&Chandola	-
Transportation Engineering	Khisty and Lal PHI	-
A Text Book of RailwayEngineering	S.P. Arora & S.C. Saxena	-
Railway Engineering	Satish Chandra	Oxford University press
Airport planning and Design	S.K.Khanna&M.G.Arora	
Airport Transportation Planning &Design.	Virendra Kumar &Satish Chandra	Galgotia Publication Pvt. Ltd.New Delhi

CO-PO mapping

	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: Studentshould 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 (Clapeyrons 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	

	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	2	3	3	3	2	2	2	2	2	2	3
CO2	3	2	2	2	3	3	1	1	3	3	2	2	3	3	2
CO3	3	2	3	3	3	1	3	2	3	3	3	3	3	2	2
CO4	3	2	2	2	2	3	2	2	2	3	3	1	2	3	3

COURSE NAME: ADVANCED FOUNDATION ENGINEERING
COURSE CODE: CE702B
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites:

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 codal 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 resistively 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 counter fort 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	McGraw Hill
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

COURSE NAME: PAVEMENT DESIGN
COURSE CODE: CE702C
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:

CO1: Understanding the pavement performance under different circumstances.
CO2: Concept 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**

Text / Reference Books:

Name	Author
Principles of Pavement Design	E.J.Yoder and M.W. Witczak , 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	

CO-PO mapping

	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	2	2	-
CO2	3	3	3	2	2	2	1	1	3	2	3	2	2	2	-

COURSE NAME: WATER AND WASTEWATER ENGINEERING
COURSE CODE: CE703A
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: 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 solids handling systems.

Course Outcome:

CO1 : Students will be able to summarize the quality parameters typically used to differentiate wastewater 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 wastes 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; Economic sizing of pumping mains/pumping station.	**4L**
Module 2: 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.	**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**
Modulet 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 / Reference Books:

Name	Author
Waste Water Treatment and Water Management : Water Treatment and Management	Anamika Srivastava
INDUSTRIAL WASTE WATER TREATMENT	A. D. Patwardhan

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	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 HRS
CREDITS : 3

Pre requisites:

Basic course on hydraulics with emphasis on fluid behavior pressure losses and application of theories in real scenario 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.
Aqua 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 able to analyze and design hydraulic structures using of practice.
CO2 : Students will able to Apply the basic design principles to engineering design practice
CO3 : To define basic theories of hydraulic structure design concepts- cross drainage works, canal falls etc.
CO4 : To define basic theories of hydraulic structure design concepts- dams, culverts, siphons etc.
CO5 : To identify seepage under hydraulic structures and protection methods.

Course contents:

Module-1: Diversion Head works: Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site, layout and description of each part, Effects of construction of a weir on the river regime, causes of failure of weirs on permeable foundation and their remedies	**4L**
Module-2: Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Foundedon 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 forseepage 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**

Module 6: Gravity Dam: Definition, Typical cross- section, Forces acting on Gravity Dam, Combination of forces for design, Mode of failure and criteria for structural stability of Gravity Dams, Principal and shear stresses. Elementary profile of a Gravity Dam, Concept of High and low Gravity Dam, Examples	**6L**
Module 7: Spillways: Types, Location, Essential requirements, spillway capacity. Components of spillway, Energy Dissipators, Stilling basins (Indian standard)	**6L**

Text / Reference Books:

Name	Author	Publishers
Hydrology & Water resources Engineering	S.K. Garg	Khanna Publication
Water resource Engineering	M.C. Chaturvedi	
Irrigation and Hydraulic Structure	S.K Garg	

CO-PO mapping

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

COURSE NAME: WATER POLLUTION AND ITS CONTROL
COURSE CODE: CE703C
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites:

. This course is intended for undergraduates 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:

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 effluents 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; Economic 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 Design Approach,	A.P. Sincero, G.A. Sincero	Prentice Hall of India , 2002

CO-PO mapping

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

COURSE NAME: HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOR
COURSE CODE: CE704A
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS: 3

Pre requisites: 10+2

Course Objective:

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.

Course Outcome:

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.

Course contents:

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 functional teams – Creating effective teams, Conflict and inter-group behaviour: Definition of conflict – Transitions in conflict thought – The conflict process – Intergroup relations	**4L**

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 employeees, Defination- Strategy- Benifits	**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 Bonous 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 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	**4L**

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

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	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	-

COURSE NAME: HISTORY OF SCIENCE & ENGINEERING
COURSE CODE: CE704B
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS: 3

Pre requisites: 10+2

Course Objective:

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.

Course Outcome:

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)

Course contents:

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 maktabs, 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, Aryabhtatta, 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, SatyendraNath Bose, MeghnadSaha, HomiJehangirBhabha 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	PO 10	PO 11	PO 12	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 HRS
CREDITS : 3

Pre requisites: 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 andanalysis 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: Developed the ability to generate the governing FE 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 problem 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, GalerkinApproach, 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] FEM for two dimensional analyses:Constant Strain Triangle, Linear Strain Triangle, Rectangular Elements	**4L**
Module-VI: [3L+1T] FEM for Plates: Introduction to Plate Bending Problems, Finite Element Analysis of Thin Plate	**4L**
Module-VII: [3L+1T] Introduction to application of standard FEM software in civil Engineering	**4L**

Text/ Reference Books:

Introduction to Finite Element in Engineering	Chandrapatla&Belegundu	Pearson Education
A First Course in Finite Element Method	D. L. Logan	Thomson
Surveying:	Bannister, Raymond & Baker	Pearson Education
Concepts and Applications of Finite Element Analysis	R. D. Cook et. al	Wiley India
Finite Element Analysis – Theory and Programming	C. S. Krishnamoorthy	Tata Mcgraw Hill
Matrix, Finite Element,Computer and Structural Analysis	M. Mukhopadhyay Oxford and IBH Publishing Co. Pvt. Ltd.	New Delhi, India
Finite Element Procedures	K. J. Bathe PHI,	New Delhi, India

CO- PO Mapping:

	PO1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	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 HRS
CREDITS : 3

Pre requisites: NIL

Course Objective:

- 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 scares 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 –Theory of Investment Basic concept of Investment, Business Fixed Investment, Accelerator Theory, Tobin's	**4L**
Module -7 Accounting Basic concept of Journal, Preparation of Income Statement and Balance Sheet	**4L**
Module – 8 Cost Volume Profit Analysis Contribution, P/V Ratio, Break-Even Point, Margin of Safety, Short term decision making: Make or Buy, Shut-down point, Export Pricing, Opportunity and Sunk cost.	**4L**

Text / Reference Books:

1. Economics, by Lipsey and Chrystal, Oxford University Press
2. Modern Accountancy, vol.-I-, by Hanif &Mukherjee,
TataMgrowHillReferences:
1. Modern Economic Theory, by K.K. Dewett, S.Chand
2. Principles of Economics, by H.L. Ahuja, S. Chand
3. Engineering Economics, by R.PaneerSeelvan, PHI
4. Economics for Engineers, by Dr. Shantanu Chakraborty &Dr. Nilanjana singharoy, Law Point Pub
5. Macro Economics, by Mankiw, Macmillan Learning

CO-PO mapping

	PO1	PO2	PO 3	PO4	PO5	PO 6	PO 7	PO8	PO 8	PO9	PO1 0	PO1 1	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 poroject 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 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 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

4th Year 8th 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 E. Public Transport System F. Ground Improvement Techniques	3	0	0	3	3
2	ENGG	Major	CE802	D. Bridge Engineering E. Pre-stressed Concrete F. Air & Noise Pollution and Control	3	0	0	3	3
3	ENGG	Minor	CE803	C. Project Management D. Cyber Law and Ethics	3	0	0	3	3
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.

COURSE NAME: STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING
COURSE CODE: CE801A
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS: 3

Pre requisites: Student should knowledge about earthquake ,retrofitting and dynamics of the structure

Course Objective: Student 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 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 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 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 undamped 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 multistoried building as per Indian Standard Code of Practice, Introduction to Response Spectrum Method, Fundamental concepts of Ductile detailing	**8L**

Text / Reference Books:

Name	Author	Publishers
Structural Dynamics (Theory and Computation)	Mario Paz	CBS Publishers and Distributor
Dynamics of Structure (Theory and Application to Earthquake Engineering)	A.K.Chopra	Pearson Education
Elements of Eathquake Engineering	Jai Krishna, A. R. Chandrashekhar and Brijesh Chandra N.C.Sinha and S.K.Roy	South Asian Publishers
Earthquake Resistant Design	D. J. Dowrick	John Willey & Sons
IS 1893 (Part 1): 2002, IS 3920, IS 4326 - Bureau of Indian Standard	-	-

CO-PO mapping:

	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
COURSE CODE: CE801B
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: Basic knowledge of Civil Engineering

Course Objective:

- 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 un loading, 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, Para transit and ride sharing, designing for pedestrians, trends in transit rider ship 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 transportationmarketing.	**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 / Reference Books:

Name	Author	Publishers
Public Transportation	George E. Gray and Lester A. Hoel	Prentice Hall, New Jersey
Urban Public Transportation Systems and Technology	Vukan R Vuchic	Prentice Hall Inc., New Jersey
City Traffic - A Systems Digest'	Horst R. Weigelt, Rainer E. Gotz, Helmut H. Weiss	Van Nostrand Reinhold Company, New York
Metropolitan Transportation Planning'	John W. Dickey	Tata McGraw-Hill Publishing Co. New Delhi

CO-PO mapping

	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
COURSE CODE: CE801C
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: 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. • Applications 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	McGraw Hill
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	McGraw Hill
Technology in tunnelling and dam construction	A.V. Shroff. & D.L. Shah	Oxford and IBH Publishing Co.Pvt.Ltd
Reinforced Earth	T S Ingold	Thoam Telford
Designing with Geosynthetics	R M 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
COURSE CODE: CE802A
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: Student 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. Pigeauds 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 / Reference Books:

Name	Author	Publishers
Bridge engineering	Krishnaraju	-
Principle & Practice of Bridge Engineering	S.P. Bindra	DhanpatRai Pub
Essentials of bridge engineering	D.J. Victor	-
Bridge engineering	Ponnuswamy	-
Design of Bridge Structures	T.R. Jagadesh, M.A. Jayaram	-
Design of concrete bridges	Aswani, Vizirani , Ratwani	-
Design of steel structures	Arya&Ajmani	-
Concrete Structures	Vaziram&Ratwani	-
Structures design and drawing	Krishnamurthy	-
Relevant IS & IRC codes	-	-

CO-PO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	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	-

COURSE NAME: PRESTRESSED CONCRETE
COURSE CODE: CE802B
CONTACT: 3:1:0
TOTAL CONTACT HOURS: 36HRS
CREDITS : 3

Pre requisites: 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

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] **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 pre stressing, 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**

Text / Reference Books:

Name	Author	Publishers
Prestressed Concrete	N Krishna Raju	McGraw Hill
Design of Prestressed Structures	T.Y.Lin and N.H.Burns	Wiley Eastern Ltd
Fundamentals of Prestressed Concrete	N.C.Sinha and S.K.Roy	-
Prestressed Concrete	S.Ramamurthan	-

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	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
COURSE CODE: CE802C
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 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 PlumeModel, 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: **Environmental Laws:** Water Act, Air Act, Motor Vehicle Act	**4L**

Text / Reference Books:

Name	Author	Publishers
Environmental Engineering	S.K. Garg	
Environmental Engineering	P.V.Rowe	

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	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

COURSE NAME: PROJECT MANAGEMENT

COURSE CODE: CE803A
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 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.

Course Outcome*:*

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

Course contents:

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, Projectsin 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-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

COURSE NAME: CYBER LAW AND ETHICS

COURSE CODE: CE803B
CONTACT: 3:0:0
TOTAL CONTACT HOURS: 36 HRS
CREDITS : 3

Pre requisites: 10+2

Course Objective:

- 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

Course Outcome*:*

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

Course contents:

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-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

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 poroject 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 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 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.