Sri

SAIRAM ENGINEERING COLLEGE

An Autonomous Institution

West Tambaram, Chennai - 44

www.sairam.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University

DEPARTMENT OF CIVIL ENGINEERING

REGULATIONS 2020

Academic Year 2020-21 onwards

AUTONOMOUS

CURRICULUM AND

SYLLABUS I - VIII

SEMESTERS

SRI SAIRAM ENGINEERING COLLEGE

VISION

To emerge as a "Centre of excellence " offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.

MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.

QUALITY POLICY

We at Sri Sai Ram Engineering College are committed to build a better Nation through Quality Education with team spirit. Our students are enabled to excel in all values of Life and become Good Citizens. We continually improve the System, Infrastructure and Service to satisfy the Students, Parents, Industry and Society.

DEPARTMENT OF CIVIL ENGINEERING

VISION

To create competent Civil engineers with ethical values and social responsibility accomplishing societal needs and skill development in sustainable infrastructure development through innovative and responsible use of technology with a sense of humanity.

MISSION

Department of Civil Engineering, SRI SAIRAM ENGINEERING COLLEGE is committed to

M1 Create and provide a platform for continuous learning and sharing of knowledge in modern technological developments.

M2 Encourage research activities with well-equipped laboratories to exhibit their true potential.

M3 Inculcate ethical and moral values to become responsible engineers and better human being.

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA101	Engineering Mathematics – I	3	1	0	4	4
2	20HSEN101	Technical English-I	3	0	0	3	3
3	20BSPH101	Engineering Physics	3	0	0	3	3
4	20BSCY101	Engineering Chemistry	3	0	0	3	3
5	20ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	20ESGE101	Engineering Graphics	1	2	0	3	3
PRACTICAL							
7	20 BSPL101	Physics and Chemistry Lab	0	0	3	3	1.5
8	20ESPL101	Programming in C Lab	0	0	3	3	1.5
VALUE ADDITIONS - I							
9	20TPHS101	Skill Enhancement	0	0	2	2	1
10	20HSMG101	Personal Values	2	0	0	2	0
TOTAL						**29**	**23**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA201	Engineering Mathematics – II	3	1	0	4	4
2	20HSEN201	Technical English -II	3	0	0	3	3
3	20ESIT201	Python Programming with lab	3	0	2	5	4
4	20BSPH204	Physics for Civil Engineering	3	0	0	3	3
5	20ESEE202	Basics of Electrical and Electronics Engineering	3	0	0	3	3
6	20ESCE201	Engineering Mechanics	3	0	0	3	3
PRACTICAL							
7	20ESGE201	Engineering Practices Lab	0	0	3	3	1.5
8	20CE PL201	Computer Aided Building Drawing	0	0	3	3	1.5
VALUE ADDITIONS - II							
9	20TPHS201	Skill Enhancement	0	0	2	2	1
10	20HSMG201	Personal Values	2	0	0	2	0
TOTAL						**31**	**24**

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
		THEORY					
1	20BSMA301	Linear Algebra, Partial Differential Equations and Transforms	3	1	0	4	4
2	20CE PC301	Strength of Materials I	3	0	0	3	3
3	20CEPC302	Plane and Geodetic Surveying	3	0	0	3	3
4	20CE PC303	Fluid Mechanics	3	0	0	3	3
5	20CE PC304	Construction Materials, Equipment & Practices	3	0	0	3	3
6	20CE PC305	Engineering Geology	3	0	0	3	3
		PRACTICAL					
7	20CE PL301	Plane and Geodetic Surveying Laboratory	0	0	3	3	1.5
8	20CE PL 302	Construction Materials Laboratory	0	0	3	3	1.5
9	20CE TE301	Live- in- Lab –I	0	0	2	2	1
		VALUE ADDITIONS - III					
10	20CETP301	Skill Enhancement	0	0	2	2	1
11	20MGMC301	Constitution of India	2	0	0	2	0
		TOTAL				**31**	**24**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
		THEORY					
1	20BSMA403	Statistics and Numerical Methods	3	1	0	4	4
2	20CEPC401	Applied Hydraulic Engineering	3	0	0	3	3
3	20CEPC402	Strength of materials II	3	0	0	3	3
4	20CEPC403	Soil Mechanics	3	0	0	3	3
5	20CEPC404	Highway Engineering	3	0	0	3	3
6	20BSCY201	Environmental Science & Engineering	3	0	0	3	3
		PRACTICAL					
7	20CEPL401	Strength of Materials Laboratory	0	0	3	3	1.5
8	20CEPL402	Hydraulic Engineering Laboratory	0	0	3	3	1.5
9	20CETE401	Live - in- Lab - II	0	0	2	2	1
		VALUE ADDITIONS - IV					
10	20CETP401	Skill Enhancement	0	0	2	2	1
		TOTAL				**29**	**24**

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
		THEORY					
1	20CEPC501	Foundation Engineering	3	0	0	3	3
2	20CEPC502	Public Health & Sanitation Engineering	3	0	0	3	3
3	20CEPC503	Design of Reinforced Cement Concrete Structures	3	0	0	3	3
4	20CEPC504	Structural Analysis I	3	0	0	3	3
5	20CEPC505	Sustainable Urban Infrastructure Development	3	0	0	3	3
6	20CEELXXX	Professional Elective - I	3	0	0	3	3
		PRACTICAL					
7	20CEPL501	Public Health & Sanitation Engineering Laboratory	0	0	3	3	1.5
8	20CEPL502	Soil Mechanics Laboratory	0	0	3	3	1.5
9.	20CETE501	Live- in- Lab -III	0	0	2	2	2
		VALUE ADDITIONS - V					
10	20CETP501	Skill Enhancement	0	0	2	2	1
		TOTAL				**29**	**24**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
		THEORY					
1	20CEPC601	Design of Steel structures	3	1	0	4	4
2	20CEPC602	Railways, Airports and Harbor Engineering	3	0	0	3	3
3	20CEPC603	Structural Analysis II	3	0	0	3	3
4	20CEELXXX	Professional Elective – II	3	0	0	3	3
5	20XXOEXXX	Open Elective-I	3	0	0	3	3
		PRACTICAL					
6	20CEPL601	Highway Engineering Laboratory	0	0	3	3	1.5
7	20HSPL501	Communication and Soft Skills Laboratory	0	0	2	2	1
8	20 CEPJ601	Innovative Design Project	0	0	2	2	1
		VALUE ADDITIONS - VI					
9	20CETP601	Skill Enhancement	0	0	2	2	1
		TOTAL				**25**	**20.5**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CEPW701	Estimation & Quantity Surveying with lab	2	0	2	4	4
2	20CEPC701	Water Resource & Irrigation Engineering	3	0	0	3	3
3	20CEPC702	Advanced Reinforced Concrete Structures	3	0	0	3	3
4	20XXOEXXX	Open Elective – II	3	0	0	3	3
5	20CEELXXX	Professional Elective - III	3	0	0	3	3
PRACTICAL							
6	20CEPL701	Computer Aided Design & Drafting Laboratory	0	0	3	3	1.5
7	20CEPJ701	Project Phase – I	0	0	4	4	2
VALUE ADDITIONS - VII							
8	20CETP701	Skill Enhancement	0	0	2	2	1
		TOTAL				**25**	**20.5**

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CEELXXX	Professional Elective - IV	3	0	0	3	3
PRACTICAL							
2	20CEPJ801	Project Phase – II	0	0	8	8	4
		TOTAL				**11**	**7**

CREDIT DISTRIBUTION

Category	BS	ES	HS	EL	PC+PL	PW	OE	TE	PJ	TP	IS	MC	TOTAL
Credit	29.5	19	7	12	71.5	4	6	4	7	7	3	Y	**170**
Percentage	17.4	11.2	4.1	7.1	42.1	1.8	3.5	2.4	4.1	4.1	1.8	-	

*IS-Internship

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CEEL501	Housing Planning & Management	3	0	0	3	Construction Engineering Management
2	20CEEL502	Environmental and Social Impact Assessment	3	0	0	3	Environmental Engineering
3	20CEEL503	Pavement Engineering	3	0	0	3	Highway Engineering
4	20CEEL504	Construction Planning, Scheduling and Control	3	0	0	3	Construction Engineering Management
5	20CEEL505	Ground Improvement Techniques	3	0	0	3	Geotechnical Engineering
6	20CEEL506	Concrete Technology	3	0	0	3	Structural Engineering
7	20CEEL507	Construction Management	3	0	0	3	Construction Engineering Management
8	20CEEL508	Watershed Management	3	0	0	3	Water Resource Engineering
9	20CEEL509	Rock Mechanics	3	0	0	3	Geotechnical Engineering
10	20CEEL510	Groundwater Engineering	3	0	0	3	Water Resource Engineering

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CEEL601	Municipal Solid Waste Management	3	0	0	3	Environmental Engineering
2	20CEEL602	Design of Plate and Shell Structures	3	0	0	3	Structural Engineering
3	20CEEL603	Prefabricated Structures.	3	0	0	3	Structural Engineering
4	20CEEL604	Bridge Engineering	3	0	0	3	Structural Engineering
5	20MGEL601	Total Quality Management	3	0	0	3	Construction Engineering Management
6	20CEEL605	Introduction to Soil Dynamics and Machine Foundations	3	0	0	3	Geotechnical Engineering
7	20CEEL606	Advanced Surveying	3	0	0	3	Remote sensing and GIS
8	20CEEL607	Geo informatics Applications for Civil Engineers	3	0	0	3	Water Resource Engineering
9	20CEEL608	Participatory WaterResources Management	3	0	0	3	Water Resource Engineering
10	20CEEL609	Powerplant Structures	3	0	0	3	Structural Engineering

PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CEEL701	Industrial Wastewater Treatment	3	0	0	3	Environmental Engineering
2	20CEEL702	Structural Dynamics and Earthquake Engineering	3	0	0	3	Structural Engineering
3	20CEEL703	Industrial Structures	3	0	0	3	Structural Engineering
4	20CEEL704	Total Station and GPS surveying	3	0	0	3	Remote sensing and GIS
5	20CEEL705	Design of Prestressed Concrete Structures	3	0	0	3	Structural Engineering
6	20CEEL706	Finite Element Methods	3	0	0	3	Structural Engineering
7	20CEEL707	Coastal Zone Management	3	0	0	3	Remote sensing and GIS
8	20CEEL708	Geo-Environmental Engineering	3	0	0	3	Environmental Engineering
9	20CEEL709	Digital Cadastre	3	0	0	3	Remote sensing and GIS
10	20CEEL710	Transport of Water and waste Water Engineering	3	0	0	3	Water Resource Engineering

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CEEL801	Maintenance, Repair and Rehabilitation of Structures	3	0	0	3	Structural Engineering
2	20CEEL802	Tall Buildings	3	0	0	3	Structural Engineering
3	20CEEL803	Building Services	3	0	0	3	Construction Engineering Management
4	20CEEL804	Composite Structures	3	0	0	3	Structural Engineering
5	20CEEL805	Contract Laws & Regulations	3	0	0	3	Structural Engineering
6	20CEEL806	Life Cycle Assessment	3	0	0	3	Environmental Engineering
7	20CEEL807	Architecture	3	0	0	3	Structural Engineering
8	20MGEL801	Professional Ethics and Values	3	0	0	3	Management
9	20MGEL501	Intellectual Property Rights	3	0	0	3	Management
10	20MGEL803	Engineering Economics and Cost Analysis	3	0	0	3	Management

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Excel in the fundamentals of mathematics, basic sciences, communication and Civil Engineering concepts to solve the real world Civil Engineering problems by imparting sound technical knowledge.

PEO2 Compete professionally with suitable and modern technological skills in the field of research and higher studies.

PEO3 Realize and practice ethical, environmental and professional responsibilities for sustainable development of society and nation.

PEO4 Exhibit strong leadership quality, eagerness for lifelong continuous learning to adopt themselves in Civil Engineering domain

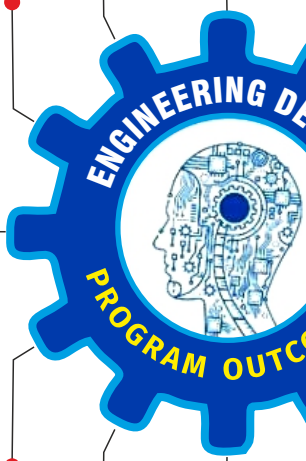
PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 Capably design and build civil engineering-based systems in the context of environmental, economical, and societal requirements and serve the community as ethical and responsible professionals.

PSO2 Be Able to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations and engage in lifelong learning for professional growth.

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



01 Engineering knowledge
Apply the basic principle and knowledge of mathematics, science and engineering principles to solve technical problems.

02 Problem Analysis
Identify and analyze complex engineering problems reaching logical conclusions using the basic principles of mathematics, science and engineering.

03 Development of solutions
Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

04 Investigate complex problems
Perform investigations, use research based knowledge and conduct experiments, analyze and interpret the results to provide valid conclusions.

05 Modern tool usage
Create, select and apply the latest techniques, resources and modern engineering / IT tools to develop appropriate solutions with an understanding of the limitations.

06 The Engineer and Society
Apply reasoning based on contextual knowledge to assess societal, legal and cultural issues with competency in professional engineering practices.

07 Environment & Sustainability
Demonstrate professional skills, knowledge and contextual reasoning to assess / environmental / societal issues for sustainable development.

08 Apply ethical principles
Apply ethical principles and commit to professional ethics and responsibilities based on the norms of professional engineering pratices.

09 Individual & Teamwork
Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary professional settings.

10 Communicate effectively
Communicate effectively amongst the engineering community, being able to comprehend & write effective reports, make presentations & give/receive clear instructions.

11 Project management
Demonstrate knowledge and apply the principles of engineering & management in their own / team projects in multidisciplinary environments.

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

SEMESTER - I

20BSMA101 SDG NO. 4	ENGINEERING MATHEMATICS-I	L	T	P	C
		3	1	0	4

OBJECTIVES:

The intent of the course is

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives and maxima and Minima
- To acquaint the concept of improper integrals and the properties of definite integrals.
- To provide understanding of double integration, triple integration and their application.
- To introduce the concept of sequence and series and impart the knowledge of Fourier series.

UNIT I MATRICES **12**

Symmetric, skew symmetric and orthogonal matrices; Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (excluding proof) – Diagonalization of a Quadratic form using orthogonal transformation - Nature of Quadratic forms.

UNIT II DIFFERENTIAL CALCULUS **12**

Limits, continuity, Differentiation rules - Maxima and Minima of functions of one variable, partial derivatives (first and second order – basic problems), Taylor's series for functions of two variables, Jacobian, Maxima & Minima of functions of several variables, saddle points; Method of Lagrange multipliers.

UNIT III INTEGRAL CALCULUS **12**

Evaluation of definite integrals - Techniques of Integration-Substitution rule - Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions. Applications of definite integrals to evaluate surface area of revolution and volume of revolution. Evaluation of improper integrals.

UNIT IV MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V SEQUENCES AND SERIES **12**

Introduction to sequences and series – power series – Taylor's series – series for exponential, trigonometric, logarithmic, hyperbolic functions – Fourier series – Half range Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

REFERENCES:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, "A text-book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2014.

WEB REFERENCES:

1. https://math.mit.edu/~gs/linearalgebra/ila0601.pdf
2. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/
3. https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial-derivatives/
4. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
2. https://www.khanacademy.org/math/differential-calculus

OUTCOMES:

Upon completion of the course, the student should be able to

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)

2. Evaluate the limit, examine the continuity and use derivatives to find extreme values of a function. (K3)
3. Evaluate definite and improper integrals using techniques of integration. (K3)
4. Apply double and triple integrals to find the area of a region and the volume of a surface. (K3)
5. Compute infinite series expansion of a function. (K3)

CO - PO MAPPING :

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

SEMESTER - I

20HSEN101 SDG NO. 4	TECHNICAL ENGLISH - I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop the basic LSRW skills of the students
- To encourage the learners to adapt to listening techniques
- To help learners develop their communication skills and converse fluently in real contexts
- To help learners develop general and technical vocabulary through reading and writing tasks
- To improve the language proficiency for better understanding of core subjects

UNIT I INTRODUCTION 9

Listening – short texts – formal and informal conversations - **Speaking** – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - **Reading –** critical reading – finding key information in a given text – shifting facts from opinions - **Writing –** free writing on any given topic – autobiographical writing - **Language Development** – tenses – voices- word formation: prefixes and suffixes – parts of speech – developing hints

UNIT II READING AND LANGUAGE DEVELOPMENT 9

Listening - long texts - TED talks - extensive speech on current affairs and discussions -Speaking – describing a simple process – asking and answering questions - **Reading** comprehension – skimming / scanning / predicting & analytical reading – question & answers – objective and descriptive answers –identifying synonyms and antonyms - process description - **Writing** instructions – **Language Development** – writing definitions – compound words.

UNIT III SPEAKING AND INTERPRETATION SKILLS 9

Listening - dialogues & conversations - **Speaking** – role plays – asking about routine actions and expressing opinions - **Reading** longer texts & making a critical analysis of the given text - **Writing** – types of paragraph and writing essays – rearrangement of jumbled sentences - writing recommendations - **Language Development** – use of sequence words - cause & effect expressions - sentences expressing purpose - picture based and newspaper based activities – single word substitutes

UNIT IV VOCABULARY BUILDING AND WRITING SKILLS 9

Listening - debates and discussions – practicing multiple tasks – self introduction – **Speaking** about friends/places/hobbies - **Reading** -Making inference from the reading passage – Predicting the content of the reading passage - **Writing** – informal letters/e-mails - **Language Development** - synonyms & antonyms - conditionals – if, unless, in case, when and others – framing questions.

UNIT V LANGUAGE DEVELOPMENT AND TECHNICAL WRITING 9

Listening - popular speeches and presentations - **Speaking** - impromptu speeches & debates - **Reading** - articles – magazines/newspapers **Writing** – essay writing on technical topics - channel conversion – bar diagram/ graph – picture interpretation - process description - **Language Development** – modal verbs - fixed / semi-fixed expressions – collocations

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. http://engineeringvideolectures.com/course/696

ONLINE RESOURCES:

1. https://www.pearson.com/english/catalogue/business-english/technical-english.html
2. https://www.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Express and explain short texts on different topics with key information applying suitable vocabulary (K2)
2. Interpret and dramatize fluently in informal and formal contexts(K2)
3. Choose and apply the right syntax in comprehending diversified general and technical articles (K3)
4. Analyze and write technical concepts in simple and lucid style (K3)
5. Construct informal letters and e-mails thoughtfully (K2)
6. Demonstrate technical concepts and summaries in correct grammar and vocabulary (K2)

CO - PO MAPPING :

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

SEMESTER - I

20BSPH101 SDG NO. 4	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To educate and enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology

UNIT I CRYSTAL PHYSICS 9

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - Powder diffraction method - Debye Scherer formula - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Diamond and Graphite structure (qualitative) - Growth of single crystals: Solution and Melt growth Techniques.

UNIT II PROPERTIES OF MATTER 9

Elasticity - Stress - strain diagram and its uses - Poisson's ratio - Relationship between three moduli of elasticity (qualitative) - Factors affecting elastic modulus and tensile strength - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III QUANTUM PHYSICS 9

Black body radiation - Planck's theory (derivation) - Compton effect: theory -

wave particle duality - electron diffraction - progressive waves - wave equation - concept of wave function and its physical significance - Schrödinger's wave equation - Time independent and Time dependent equations - particle in a box (one dimensional motion) - Tunneling (qualitative) - scanning tunneling microscope.

UNIT IV LASERS AND FIBER OPTICS 9

Lasers: population of energy levels, Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - three level and four level laser - CO_2 laser - Semiconductor lasers: Homojunction and Heterojunction.

Fiber optics: Principle, Numerical aperture and Acceptance angle - Types of optical fibers (material, refractive index, mode) - Losses associated with optical fibers - Fiber Optical Communication system (Block diagram) - Fiber optic sensors: pressure and displacement.

UNIT V THERMAL PHYSICS 9

Transfer of heat energy - thermal expansion of solids and liquids - bimetallic strips - thermal conduction, convection and radiation - heat conduction in solids (qualitative) - thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - thermal insulation - applications: heat exchangers, refrigerators and solar water heaters.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. D.K. Bhattachary & T.Poonam, "Engineering Physics". Oxford University Press, 2015.
2. R.K. Gaur& S.L. Gupta, "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics", Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu& P.G. Kshirshagar, "A textbook of Engineering Physics", S. Chand & Co Ltd. 2016.

REFERENCES:

1. D. Halliday, . Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma," Physics for Engineers", PHI Learning Private Limited, 2014.

4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.

OUTCOMES :

Upon completion of the course, the student should be able to

1. To understand the crystal systems and elastic properties of Materials (K2)
2. To distinguish different crystal structures and heat conduction in conductor and insulators (K4)
3. To explain powder diffractionmethod-deformation of materials in response to action load,quantum mechanics to understand wave particle dualism (K2)
4. To apply quantum theory to set up one dimensional Schrodinger's wave equation and applications to a matter wave system and principle of laser action (K3)
5. To analyze bending of beams,types of optical fiber and modes of heat transfer (K4)
6. To discuss light propagation in optical fibers and transfer of heat energy in different measures and its applications (K2)

CO - PO MAPPING :

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

SEMESTER - I

20BSCY101 SDG NO. 4,6&7	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques
- To illustrate the principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials
- To categorize types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels
- To demonstrate the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills and fuel cells
- To recognize the applications of polymers, composites and nano-materials in various fields

UNIT I WATER TECHNOLOGY AND SURFACE CHEMISTRY 9

Water Technology : Introduction – Hard water and Soft water. Hardness of water – types – expression of hardness (numerical problems). Boiler troubles – scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion. Treatment of boiler feed water – Internal treatment (carbonate, phosphate, calgon, colloidal and sodium aluminate conditioning). External treatment – Ion exchange process, Zeolite process –Domestic water treatment (break point chlorination) –Desalination of brackish water – Reverse Osmosis.

Surface Chemistry: Adsorption – types – adsorption of gases on solids – adsorption of solutes from solution – applications of adsorption –role of adsorbents in catalysis and pollution abatement.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemistry: Cells – types (electrochemical and electrolytic cell) Redox reaction – single electrode potential (oxidation potential and reduction potential) – measurement and applications –Nernst equation (derivation and problems) – electrochemical series and its significance.

Corrosion: Causes, factors and types – chemical and electrochemical corrosion (galvanic, differential aeration). Corrosion control – material selection and design aspects, cathodic protection methods (sacrificial anodic and impressed current cathodic method) and corrosion inhibitors. Paints: Constituents and its functions. Electroplating of Copper and electroless plating of Nickel.

UNIT III FUELS AND COMBUSTION 9

Fuels: Introduction – classification of fuels – Coal – analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – octane number and cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gases (LPG). Biofuels – Gobar gas and Biodiesel.

Combustion of Fuels: Introduction – calorific value – higher and lower calorific values- theoretical calculation of calorific value – flue gas analysis (ORSAT Method).

UNIT IV ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources: Nuclear fission – nuclear fusion – differences between nuclear fission and fusion – nuclear chain reactions – nuclear energy – light water nuclear power plant – breeder reactor – solar energy conversion – solar cells – wind energy.

Storage devices: Batteries – types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium–ion–battery), fuel cells – H_2 -O_2 fuel cell and super capacitors.

UNIT V POLYMERS AND NANOMATERIALS 9

Polymers: Classification – types of polymerization – mechanism (Free radical polymerization) –Engineering polymers: Nylon–6, Nylon–6,6, Teflon, Kevlar and PEEK – preparation, properties and uses – Plastic and its types - Conducting polymers – types and applications. Composites – definition, types, polymer matrix composites – FRP.

Nanomaterials: Introduction – Nanoparticles, Nanoclusters, Nanorods, Nanotubes (CNT: SWNT and MWNT) and Nanowires – Properties (surface to volume ratio, melting point, optical and electrical), Synthesis (precipitation, thermolysis, hydrothermal, electrodeposition, chemical vapour deposition, laser ablation, sol-gel process) and Applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" DhanpatRai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2021.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

OUTCOMES

Upon completion of the course, the student should be able to

1. Identify the origin of water resources and develop innovative methods to produce soft water for industrial use and potable water at cheaper cost and recognize the basic design of adsorption systems and its industrial applications. (K2)
2. Recognize the basic concepts of electrochemistry and apply the principles of electrochemistry to corrosion process and the applications of protective coatings to overcome the corrosion. (K2)
3. Disseminating the importance of chemistry of fuels and combustion to enhance the fuel efficiency. (K2)
4. Acquire the basics of non-conventional sources of energy and illustrate the principles and the reaction mechanism of batteries and fuel cells. (K2)
5. Explain the synthesis and applications of polymers, composites and nano-materials. (K2)

CO – PO MAPPING:

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

SEMESTER - I

20ESCS101 SDG NO. 4&9	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand about the programming language
- To develop C Programs using basic Programming Constructs, Loops Arrays and Strings
- To develop applications in C using Functions , Pointers and Structures
- To perform I/O operations and File Handling in C

UNIT I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING 10

The Basic Model of Computation, Programming Paradigms- Program Development Life Cycle - Algorithm –Pseudo Code – Flow Chart - Programming Languages - Compilation - Linking and Loading - Testing and Debugging - Documentation - Control Structures – Algorithmic Problem Solving- Problems Based on Sequential, Decision Making - Branching and Iteration.

UNIT II BASICS OF C PROGRAMMING 8

Structure of C program - C programming: Data Types – Storage Classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output Statements - Assignment Statements – Decision making Statements - Switch Statement - Looping Statements – Pre-Processor Directives - Compilation Process

UNIT III ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy – Selection Sort - Linear and Binary Search.

UNIT IV FUNCTIONS AND POINTERS 9

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers –

Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

UNIT V STRUCTURES and FILE PROCESSING 9

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2012.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication.
2. Jeri R. Hanly & Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
6. Kanetkar Y, "Let us C", BPB Publications, 2007.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

1. https://www.learn-c.org/
2. https://codeforwin.org/
3. https://www.cprogramming.com/

ONLINE RESOURCES:

1. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial
2. https://nptel.ac.in/courses/106105171
3. https://swayam.gov.in/nd1_noc19_cs42/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop efficient algorithms for solving a problem. (K2)
2. Use the various constructs in C to develop simple applications. (K3)
3. Design and Implement applications using Array & Strings. (K3)
4. Develop applications using Functions and Pointers. (K6)
5. Design and Develop applications using Structures. (K3)
6. Design and Develop applications using Files. (K4)

CO- PO MAPPING :

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

SEMESTER - I

20ESGE101 SDG NO. 4,6,7, 9, 12,14 &15	ENGINEERING GRAPHICS	L	T	P	C
		1	2	0	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To visualize the job in three dimensions
- To have a clear conception and appreciation of the shape, size, proportion and design
- To expose the student community to existing national standards related to technical drawings

CONCEPTS AND CONVENTIONS (Not for Examination) 3

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Projection of Points

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – construction of involutes of circle for one complete revolution – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF LINES AND PLANE SURFACE 6+9

Orthographic projection- principles-Principal planes- Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method- Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 6+9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+9

Sectioning of prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and truncated solids in vertical position – Prisms, pyramids cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinder, cone- Perspective projection of simple solids-Prisms, pyramids and cylinder by visual ray method.

TOTAL: 78 PERIODS

TEXT BOOKS:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
3. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
6. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
7. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/112/103/112103019/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104148/

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

OUTCOMES:

Upon completion of the course, the student should be able to

1. Relate thoughts and ideas graphically in a neat fashion and ability to perform sketching of engineering curves used in engineering practices, multiple views of objects. (K1)
2. Understand the concepts of orthographic projections for basic geometrical constructions. (K2)
3. Acquire the knowledge of orthographic projection in three dimensional object. (K2)
4. Develop knowledge about Sectioning and apply interior shapes of solids. (K3)
5. Analyze the concepts of design in developing various 3 dimensional projections. (K4)
6. Build a strong foundation to analyze the design in various dimensions. (K4)

CO - PO , PSO MAPPING:

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

SEMESTER - I

20BSPL101 SDG NO. 4	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	3	1.5

PHYSICS LABORATORY

OBJECTIVES:

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

LIST OF EXPERIMENTS (Any 5 Experiments)

1. Determination of Young's modulus by non-uniform bending method.
2. Determination of rigidity modulus –Torsion pendulum.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4. (a) Determination of wavelength and particle size using Laser.
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's bridge.
7. Determination of wavelength of mercury spectrum – spectrometer grating.
8. Determination of band gap of a semiconductor.
9. Determination of Hall coefficient by Hall Effect experiment.
10. Determination of solar cell characteristics.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (max.) STUDENTS PER EXPERIMENT

1. Young's modulus by non-uniform bending method-experimental set-up – 12 sets
2. Rigidity modulus - Torsion pendulum experimental set-up – 12 sets
3. Ultrasonic Interferometer to determine velocity of sound and compressibility of liquid – 6 sets
4. (a) Experimental set-up to find the wavelength of light, and to find particle size using Laser – 6 sets
   (b) Experimental set-up to find acceptance angle in an optical fiber – 6 sets
5. Lee's disc method- experimental set up to find thermal conductivity of a bad conductor – 6 sets
6. Experimental set-up to find specific resistance of a coil of wire-Carey Foster's Bridge – 6 sets
7. Experimental set-up to find the wavelength of mercury spectrum-spectrometer grating – 6 sets
8. Experimental set-up to find the band gap of a semiconductor – 12 sets
9. Experimental set-up to find the Hall coefficient by Hall Effect Experiment – 6 sets
10. Experimental set-up to study characteristics of solar cells – 6 sets

TEXTBOOKS:

1. J.D. Wilson& C.A. Hernandez Hall "Physics Laboratory Experiments" Houghton Mifflin Company, New York, 2010.
2. M.N. Srinivasan, S. Balasubramanian &R. Ranganathan, "Practical Physics", S. Chand & Sons educational publications, New Delhi, 2011.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

CHEMISTRY LABORATORY

(Any five experiments to be conducted)

OBJECTIVES:

- To acquaint the students with practical knowledge of the basic concepts of chemistry, the student faces during the course of their study in the industry and engineering field
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis
- To understand and develop experimental skills for building technical competence

LIST OF EXPERIMENTS (Any five experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water samples.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
9. Estimation of sodium and potassium present in water using flame photometers.
10. Determination of molecular weights of polymers using Ostwald's Viscometer.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (MAX.) STUDENTS PER EXPERIMENT.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample - 6 sets
2. Determination of total, temporary & permanent hardness of water by EDTA method - 6 sets
3. Determination of DO content of water sample by Winkler's method - 6sets
4. Determination of chloride content of water sample by argentometric method – 6 sets
5. Determination of strength of given hydrochloric acid using pH meter - 6 sets
6. Conductometric titration of strong acid vs strong base - 6 sets
7. Estimation of iron content of the given solution using potentiometer - 6 sets
8. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method) - 2 sets
9. Estimation of sodium and potassium present in water using flame photometer - 2 sets
10. Determination of molecular weights of polymer using Ostwald's Viscometer. - 6 sets

TOTAL: 30 PERIODS

TEXTBOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the principles of thermal physics and properties of matter to evaluate the properties of materials and to determine the physical properties of liquid using ultrasonic interferometer. (K1)
2. Understand measurement technique and usage of new instruments in optics for real time application in engineering. (K2)
3. Apply the knowledge of semiconductor materials to evaluate the band gap and Hall coefficient of materials and to study the characteristics of solar cell for engineering solutions. (K3)
4. Interpret quantitative chemical analysis to generate experimental skills in building technical competence. (K3)
5. Analyze the quality of water for domestic and industrial purpose. (K3)

6. Standardize the solutions using volumetric titrations, conductivity, pH, redox potential and optical density measurements. (K3)

CO- PO MAPPING :

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

SEMESTER - I

20ESPL101 SDG NO. 4&9	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

LIST OF EXPERIMENTS

1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is Armstrong number or not?
6. Write a program tocheck whether a given number is odd or even?

7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to display array elements using two dimensional arrays.
10. Write a program to perform swapping using function.
11. Write a program to display all prime numbers between two intervals using functions.
12. Write a program to reverse a sentence using recursion.
13. Write a program to get the largest element of an array using the function.
14. Write a program to concatenate two string.
15. Write a program to find the length of String.
16. Write a program to find the frequency of a character in a string.
17. Write a program to store Student Information in Structure and Display it.
18. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
    (a) Total marks obtained by each student.
    (b) The highest marks in each subject and the marks of the student who secured it.
    (c) The student who obtained the highest total marks.
19. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
20. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Solve some simple problems leading to specific applications. (K6)
2. Demonstrate C programming development environment, compiling, debugging, linking and executing a program. (K6)
3. Develop C programs for simple applications making use of basic constructs, arrays and strings. (K6)
4. Develop C programs involving functions and recursion. (K6)
5. Develop C programs involving pointers, and structures. (K6)
6. Design applications using sequential and random access file. (K6)

CO- PO MAPPING :

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

SEMESTER - I

20TPHS101 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To enrich social network ethics
- To develop and enhance browsing culture
- To understand the concepts of networking
- To promote self professionalism
- To acquire knowledge about various digital identification procedures

UNIT I SOCIAL NETWORK ETIQUETTES **6**

Introduction to social network – Social Networking Etiquettes - Pros and Cons - Usage of Facebook, Instagram, WhatsApp , Telegram, Youtube, Evolution of Android and IOS, Introduction to Linkedin & Benefits. (Practicals – Official Mail id- Linkedin Id Creation, Linkedin Profile Bulilding , Facebook Id and Creation and Modifying the existing FB ID)

UNIT II BROWSING CULTURE **6**

Introduction to browsing – Search Engines-Google - Bing -Yahoo!-AOL -MSN –DuckDuckGo ,browsers, phishing – Cookies - URL – https:// extensions , browsing history, Incognito mode- VPN – Pros and Cons – Book mark.

UNIT III NETWORKING **6**

Basics of networking - LAN, MAN, WAN, Introduction to network topologies, Protocols , IP Commands (Command line prompt), Define online complier and

editor (Practicals – Find Your System IP,Ping Command, Firewall Fortinet, Basic DOS Commands)

UNIT IV PROFESSIONALISM **6**

Dress Code, Body Language, Appropriate Attire ,Communication Skills, Interview preparation – Introducing yourself - How to greet Superiors, Importance of Eye Contact During conversation.

UNIT V DIGITAL IDENTIFICATION **6**

Introduction to NAD - Importance of Aadhar, PAN Card, Passport, Bank Account, Bar Code, QR scan, Payment Gateway (Gpay, Phone Pe, UPI, BHIM, Paytm), Mobile Banking (Practicals - NAD registration Step by Step, Linking bank account with netbanking , Register for payment gateway).

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Social Network Etiquettes:

1. https://sproutsocial.com/glossary/social-media-etiquette/
2. https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/socialnetworkingsitespolicy.aspx
3. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02711/full
4. https://medium.com/@sirajea/11-reasons-why-you-should-use-telegram-instead-of-whatsapp-ab0f80fbfa79
5. https://buffer.com/library/how-to-use-instagram/
6. https://www.webwise.ie/parents/what-is-youtube/
7. https://www.androidauthority.com/history-android-os-name-789433/
8. https://www.mindtools.com/pages/article/linkedin.htm

Unit II: Browsing Culture:

1. https://sites.google.com/site/bethanycollegeofteacheredn/unit--ict-connecting-with-world/national-policy-on-information-and-communication-technology-ict/accessing-the-web-introduction-to-the-browser-browsing-web
2. https://www.wordstream.com/articles/internet-search-engines-history
3. https://www.malwarebytes.com/phishing/
4. https://www.adpushup.com/blog/types-of-cookies/
5. https://www.eff.org/https-everywhere
6. https://www.sciencedirect.com/topics/computer-science/browsing-history\

7. https://www.vpnmentor.com/blog/pros-cons-vpn/
8. https://www.tech-wonders.com/2016/10/use-hush-private-bookmarking-extension-chrome.html

Unit III:Networking

1. https://www.guru99.com/types-of-computer-network.html
2. https://www.studytonight.com/computer-networks/network-topology-types
3. https://www.cloudflare.com/learning/network-layer/what-is-a-protocol/
4. https://www.howtogeek.com/168896/10-useful-windows-commands-you-should-know/
5. https://paiza.io/en

Unit IV : Professionalism

1. https://career.vt.edu/develop/professionalism.html
2. https://englishlabs.in/importance-dress-code/
3. https://www.proschoolonline.com/blog/importance-of-body-language-in-day-to-day-life
4. https://www.thespruce.com/etiquette-of-proper-attire-1216800
5. https://shirleytaylor.com/why-are-communication-skills-important/
6. https://www.triad-eng.com/interview-tips-for-engineers/
7. https://www.indeed.co.in/career-advice/interviewing/interview-question-tell-me-about-yourself
8. https://toggl.com/track/business-etiquette-rules/

Unit V: Digital Identification

1. https://nad.ndml.in/nad-presentation.html
2. https://www.turtlemint.com/aadhaar-card-benefits/
3. https://www.bankbazaar.com/pan-card/uses-of-pan-card.html
4. https://www.passportindex.org/passport.php
5. https://consumer.westchestergov.com/financial-education/money-management/benefits-of-a-bank-account
6. https://en.wikipedia.org/wiki/QR_code
7. https://www.investopedia.com/terms/p/payment-gateway.asp
8. https://www.paisabazaar.com/banking/mobile-banking/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Learn and apply social network ethics. (K3)
2. Understand the browsing culture. (K2)
3. Analyze the networking concepts . (K4)
4. Develop self professionalism. (K3)
5. Gain hands-on experience in various digital identification procedures. (K2)
6. Analyse and apply the different digital payment gateway methods. (K4)

CO- PO MAPPING :

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

SEMESTER - I

20HSMG101 SDG NO. 4&5	PERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I SELF CONCEPT **6**

Understanding self Concept – Identify Yourself – Who am I – an individual, engineer, citizen – Attitude – Measuring Behaviour – Change of Behaviour – Personality – Characteristics in personal, professional life.

UNIT II INDIVIDUAL VALUES **6**

Personal Values – Attributes –Courage – Creativity, Honesty, Perfection, Simplicity, Responsibility – Measuring personal values

UNIT III MORAL VALUES **6**

Moral – Understanding right and wrong – Positive thoughts – Respect to others – Doing good to society.

UNIT IV PHYSICAL AND MENTAL WELL-BEING **6**

Health – Physical fitness –Mental vigour – Diet management – Yoga – Meditation – Peaceful life – Happiness in life

UNIT V DECISION MAKING **6**

Goal Setting – Decision making skill – Overcome of Barriers – Success – Mental strength and weakness

TOTAL: 30 PERIODS

Note:

Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development" McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Become an individual in knowing the self. (K4)
2. Acquire and express Personal Values, Spiritual values and fitness. (K4)
3. Practice simple physical exercise and breathing techniques. (K2)
4. Practice Yoga asana which will enhance the quality of life. (K1)
5. Practice Meditation and get benefitted. (K1)
6. Understanding moral values and need of physical fitness. (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Co1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - II

20BSMA201 SDG NO. 4	ENGINEERING MATHEMATICS - II	L	T	P	C
		3	1	0	4

OBJECTIVES:

- The objective of this course is to familiarize the prospective engineers with techniques in Vector Calculus, Ordinary differential equations, Complex variables and Laplace transforms. It aims to equip the students to deal with advanced levels of Mathematics and applications that would be essential for their disciplines.

UNIT I VECTOR CALCULUS 12

Gradient and Directional derivatives - Divergence and Curl- Vector identities - Irrotational and Solenoidal vector fields - Line integral over a plane curve - Surface integral - Volume integral – Gauss divergence, Green's and Stoke's theorems - Verification and application in evaluating line, Surface and volume integrals.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 12

Second and higher order linear differential equations with constant coefficients - Method of variation of parameters - Homogeneous equation of Euler's and Legendre's types - System of simultaneous linear differential equations with constant coefficients.

UNIT III COMPLEX DIFFERENTIATION 12

Analytic functions- Necessary and sufficient conditions for analyticity in cartesian and polar coordinates (without proof) - Properties - Harmonic conjugate - construction of analytic functions- Conformal mapping - Mapping by functions $w = z+a, w=az, w=1/z, w=z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Contour integrals, Cauchy- Goursat theorem (without proof) - Cauchy Integral formula (without proof) - Taylor's series - Zeroes of Analytic functions - Singularities - Laurent's Series - Residues – Cauchy Residue theorem (without proof) – Application of Residue theorem for evaluation of real integrals – use of circular contour and semicircular contour(without poles on real axis).

UNIT V LAPLACE TRANSFORM 12

Existence conditions – Transforms of elementary functions – Transform of Unit step function and Unit impulse function – Basic properties – Shifting

theorems – Transforms of derivatives and integrals – Initial and Final value theorems – Convolution theorem – Transform of Periodic functions – Application of solution of linear second order ordinary differential equations with constant coefficients.

TEXT BOOKS:

1. Erwin Kreyszig, Advance Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, New Delhi, 2008.

REFERENCES:

1. Dass, H.K., and Er. Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2010.
3. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.
4. E.A.Coddinton, "An Introduction to Ordinary Differential Equations", Prentice Hall India, 1995.
5. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th Edition, 2014.
6. N.P.Bali and Manish Goyal, "A text Book of Engineering Mathematics", Laxmi Publications, Reprint 2008.

WEB COURSES:

1. https://nptel.ac.in/courses/122107036/
2. https://nptel.ac.in/courses/111105134/
3. https://ocw.mit.edu/courses/mathematics/18-04-complex-variables-with-applications-spring-2018/
4. https://ocw.mit.edu/courses/mathematics/18-02-multivariable-calculus-fall-2007/
5. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/

ONLINE RESOURCES:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/lecture-1-introduction/
2. http://www.nptelvideos.com/course.php?id=90

COURSE OUTCOMES:

Upon completion of the course, the student should be able to

1. Compute the derivatives of scalar and vector point functions. Use vector point function to establish a relation between line, surface and volume integrals. (K3)
2. Solve ordinary differential equations of second and higher order with constant coefficients, variable coefficients and simultaneous linear differential equations. (K3)
3. Construct an analytic function and apply the properties of analytic functions to check for harmonic and orthogonal functions and find the images of circle and straight lines under the standard transformations. (K3)
4. Use Cauchy's integral theorem, formula and Cauchy's Residue theorem to evaluate complex and real integrals, find the Taylor's and Laurent's series expansion. (K3)
5. Apply Laplace and inverse Laplace Transforms to solve the Linear ordinary differential equations with constant coefficients. (K3)

CO - PO MAPPING:

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

SEMESTER - II

20HSEN201 SDG NO. 4	TECHNICAL ENGLISH - II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To strengthen the listening skills for comprehending and critically analyzing passages
- To enhance students' ability with multiple strategies and skills for making technical presentations
- To participate in group discussions for developing group attitude
- To develop skills for preparing effective job application
- To write effective technical reports

UNIT I LANGUAGE DEVELOPMENT **9**

Listening – Listening conversations involving two participants – multiple participants – **Speaking** – conversation methods in real life occurrences using expressions of different emotions and imperative usages – **Reading** passages and short stories - **Writing** – preparation of checklist – extended definition – **Language Development** – tenses - subject - verb agreement

UNIT II VOCABULARY BUILDING **9**

Listening – listening formal and informal conversation and participative exercises – **Speaking** - creating greetings/wishes/excuses and thanks – **Reading** – articles/novels-**Writing** summary of articles and concise writing identifying new words – homonyms, homophones, homographs – one-word substitutions – easily confused words - creating SMS and using emoticons - sharing information in social media. **Language Development** - reported speeches – regular and irregular verbs - idioms & phrases

UNIT III WRITING TECHNICAL REPORTS **9**

Listening – listening conversation – effective use of words and their sound aspects, stress, intonation & pronunciation – **Speaking** - practicing telephonic conversations – observing and responding. **Reading** – regular columns of newspapers/magazines - **Writing** – reports – feasibility, accident, survey and progress - preparation of agenda and minutes – **Language Development** - using connectives – discourse markers

UNIT IV TECHNICAL WRITING **9**

Listening – Model debates & documentaries - **Speaking** – expressing agreement/disagreement, assertiveness in expressing opinions – **Reading**

biographies/autobiographies – **Writing** – note-making – formal letters – inviting guests – acceptance/declining letters - **Language Development** – degrees of comparison - numerical adjectives – embedded sentences

UNIT V GROUP DISCUSSION AND JOB APPLICATION 9

Listening – Listening - classroom lectures – recommending suggestions & solutions – **Speaking** – participating in group discussion – learning GD strategies – **Reading** – journal articles - Writing – Job application – cover letter - résumé preparation – **Language Development** – purpose statement – editing – verbal analogies.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.
2. Ashraf Rizvi. M, Effective Technical Communication. 2nd ed. McGraw Hill, New Delhi, 2018.

REFERENCES

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York,2011.
2. Raman, Meenakshi and Sharma, Sangeetha. Technical Communication Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan& Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamilnadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Suresh Kumar, E. Engineering English. Orient Blackswan, Hyderabad, 2015
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES :

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://freevideolectures.com/course/3250/introduction-to-film-studies/10

ONLINE RESOURCES

1. https://www.ef.com/wwen/english-resources/

2. https://www.smilesforlearning.org/gclid=EAIaIQobChMI49DF9bnd6AIVSY6PCh1d_gV9EAAYASAAEgIBPvD_BwE.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Define technical terms with the correct use of grammar (K1)
2 Identify new words, phrases, idioms and summarize articles/ write ups effectively (K2)
3 Pronounce words correctly, speak fluently and share opinions and suggestions effectively in conversations, debates and discussions (K3)
4 Construct reports convincingly and write official letters emphatically (K3)
5 Communicate confidently while speaking and writing by employing language strategies (K2)
6 Adapt group behavior, execute their role as a contributing team member and prepare winning job applications (K3)

CO - PO MAPPING:

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

SEMESTER - II

20ESIT201 SDG NO. 4	PYTHON PROGRAMMING WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To Develop Python Programs with Conditionals and Loops
- To Use Python Data Structures – Lists, Tuples, Dictionaries, Sets
- To Define Python Functions and Work with Modules and Packages
- To Work with Python Classes, Objects and Handling Exceptions

UNIT I BASICS OF PYTHON PROGRAMMING 9

Python Interpreter and Interactive Mode - Features – History of Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved Words – Indentation – Operators and Expressions – Operator Precedence– Operations on Strings – Other Data types – Type Conversion - Illustrative Programs: Use of various Operators, Evaluation of expressions, String Operations.

UNIT II DECISION CONTROL STATEMENTS 9

Conditionals: Boolean Values and Operators, Conditional (if) - Alternative (if-else) - Chained Conditional (if-elif-else) - Iteration: state - while - for - break - continue - pass - Illustrative Programs: Exchange the Values of Two Variables - Circulate the values of N Variables - Distance Between Two Points - Square Root - GCD - Exponentiation - Sum and Array of Numbers.

UNIT III STRING, LISTS, TUPLES, DICTIONARIES, SETS 9

Strings: String Slices - Immutability - String functions and methods - String Module - Lists: List Operations - List Slices - List methods - List Loop - Mutability - Aliasing - Cloning lists - List Parameters - Tuples: Tuple Assignment - Tuple as return value - Dictionaries: Operations and Methods - Advanced List Processing - List Comprehension - Sets: Creating Sets – Operations and Methods – Set Comprehension - Illustrative programs: Linear Search - Binary Search - Selection Sort - Insertion Sort - Merge Sort - Histogram.

UNIT IV FUNCTIONS, MODULES AND PACKAGES 9

Functions - Function Definition and Use - Flow of Execution - Parameters and Arguments - Fruitful Functions: Return values - Parameters - Local and Global Scope - Function Composition - Recursion - Modules – from-import Statement – Name of Module – Making your own modules - Packages - Standard Library Modules – globals(), locals() and reload() - Illustrative programs: Fibonacci Series using functions - Arithmetic Operations using Module - Area of different shapes using Packages.

UNIT V CLASSES, OBJECTS AND EXCEPTION HANDLING 9

Classes and Objects – Defining Classes – Creating Objects – Data Abstraction and Hiding through Classes - init() method – Class Variables and Object Variables – Introduction to Errors and Exception Handling – Handling Exceptions – Multiple Except Blocks – else Clause – Raising Exceptions – Built-in and User-defined Exceptions – Finally Block.

LIST OF EXPERIMENTS

1. Write a Python program to perform
   a. Linear Search
   b. Binary Search
2. Write a Python program to perform Selection Sort.
3. Write a Python program to sort the given numbers using Insertion Sort.
4. Write a Python program to do sorting using Merge sort.
5. Write a Python program to find first n prime numbers.
6. Write a Python program to Multiply two matrices.
7. Write a Python program to create Student class and instantiate its Object.
8. Write a Python License verification process using Exception handling.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. ReemaThareja. "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, O'Reilly Publishers, 2016.

REFERENCES:

1. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" Revised and updated for Python 3.2, Network Theory Ltd., 2011.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
6. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
7. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

WEB REFERENCES:

1. http://greenteapress.com/wp/think-python/
2. www.docs.python.org
3. https://nptel.ac.in/courses/106/106/106106182/

.OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the syntax, semantics and control flow statements of Python programming. (K2)
2. Implement simple programs using control structures in Python. (K3)
3. Explain the methods to create and manipulate strings, lists, dictionaries, tuples and sets. (K2)
4. Articulate the concepts of functions, modules and packages in Python. (K2)
5. Implement simple programs using Python Data types and functions. (K3)
6. Apply the concepts of Exception handling, classes and objects. (K3)

CO - PO, MAPPING :

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

SEMESTER - II

20BSPH204 SDG NO. 4	PHYSICS FOR CIVIL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the principles of acoustics and its applications in engineering
- To learn about the optical properties like photometry in civil engineering
- To understand the principles and applications of new engineering materials
- To understand the thermal performance of buildings in civil engineering.
- To study the Geo physics aspect of volcanoes etc., in civil engineering applications

UNIT I ACOUSTICS **9**

Introduction- Classification of sound- Characteristics of sound- - decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay

method – Measurement of absorption Coefficient and its determination – Factors affecting acoustics of buildings and their remedies. Methods of sound absorptions - absorbing materials - noise pollution and its measurements, sound insulation and its measurements.

UNIT II NEW ENGINEERING MATERIALS 9

Metallic glasses - Shape memory alloys - Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - - Ceramics - Classification - Crystalline Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres ferroelectric and ferromagnetic ceramics - High Aluminium ceramics.

UNIT III LIGHTING DESIGNS 9

Basic definitions for Radiometry and photometry- conversion of photometry - cosines law, inverse square law. Vision –and Colour – luminous efficiency function- Visual field glare, colour - day light calculations - daylight design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT IV THERMAL PERFORMANCE OF BUILDINGS 9

Heat transfer through fenestrations- thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, shading devices - central heating. Principles of natural ventilation - ventilation measurements, design for natural ventilation - Window types and packaged air conditioners - chilled water plant - fan coil systems water piping - cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C.Systems.

UNIT V GEOPHYSICS 9

Origin of the Earth-Age of the Earth-Interior of the earth-structure and constitution of the interior of the earth –Earthquake definition- Earthquake Seismology –Earthquake waves and their transmission - Seismographs - Distribution of earthquake belts-site effects - Probabilistic and deterministic Seismic hazard analysis – Volcanoes Distribution-causes-Effect of volcanic eruptions.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Alexander, D. "Natural disaster", Springer (1993).
2. Budinski, K.G. & Budinski, M.K. "Engineering Materials Properties and Selection", Prentice Hall, 2009.
3. Severns, W.H. & Fellows, J.R. "Air conditioning and Refrigeration", John Wiley and Sons, London, 1988.
4. Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.
5. Structural Geology by R.J. Twiss and E.M. Moores,W. H. Freeman and Co., New York,1992
6. R.J.Foster, "Structural Geology", Merrill publication .doc, London 1988.

REFERENCES:

1. Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai publishers, 2012.
2. Reiter, L. "Earthquake hazard analysis - Issues and insights", Columbia University Press, 1991.
3. Shearer, P.M. "Introduction to Seismology", Cambridge University Press, 1999.
4. Radhakrishnan, "General Gelogy"

OUTCOMES:

Upon completion of the course, the student should be able to

1. Discuss the basic idea of sound concept and its used in various Acoustics applications and its remedies (K2)
2. Explain the basic concept of composite materials, ceramic materials, New engineering materials and shape memory alloy (K2)
3. Discuss the basic idea of lightning techniques and design and analysis of artificial lightning system for building (K1)
4. Discuss the concept of thermal insulation and relate their performance in the buildings (K3)
5. Describe the principle of natural ventilation and their design related to air conditioning System (K3)
6. Explain the concepts of earthquake and volcanoes related with Geophysics (K2)

CO, PO MAPPING:

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

SEMESTER - II

20ESEE202 SDG NO. 4	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Electric circuit laws, single and three phase circuits and wiring
- Working principles of Electrical Machines
- Working principle of various electronic devices and measuring instruments

UNIT I ELECTRICAL CIRCUITS **9**

Basic circuit components - Ohms Law - Kirchoff's Law – Instantaneous Power – Inductors - Capacitors – Independent and Dependent Sources - steady state solution of DC circuits - Nodal analysis, Mesh analysis- Thevinin's Theorem, Norton's Theorem, Maximum Power transfer theoremLinearity and Superposition Theorem.

UNIT II AC CIRCUITS **9**

Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits – Three phase loads - housing wiring, industrial wiring, materials of wiring.

UNIT III ELECTRICAL MACHINES **9**

Construction,Principles of operation and characteristics of DC Generators, DC Motors, single phaseTransformers, single phase induction motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS **9**

Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction –Forward and Reverse Bias –Semiconductor Diodes –Bipolar Junction Transistor – Characteristics – Field Effect Transistors – Transistor Biasing –Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier –DAC – ADC .

UNIT V MEASUREMENTS & INSTRUMENTATION **9**

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical -Classification of instruments - Types of indicating Instruments – three-phase power measurements – instrument transformers (CT and PT) .

TOTAL : 45 PERIODS

TEXT BOOKS:

1. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, 4th Edition, April 12, 2019.
2. Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008

REFERENCES:

1. Allan S Moris, "Measurement and Instrumentation Principles", Elseveir, First Indian Edition, 2006
2. Rajendra Prasad, "Fundamentals of Electrical Engineering", Prentice Hall of India, 2006
3. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw Hill Education(India) Private Limited, 2009

WEB REFERENCES:

1. http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF-313p).html
2. https://www.electrical4u.com/principle-of-dc-generator/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/108/102/108102097/
2. https://nptel.ac.in/courses/108/105/108105153/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Infer the basic concepts of DC circuits. (K3)
2. Analyse the AC circuits.(K4)
3. Illustratethe working principles of electrical machines. (K3)
4. Explain the concepts of various electronic devices. (K2)
5. Choose appropriate instruments for electrical measurement for a specific application. (K3)
6. Summarize the need of transducers in various instruments. (K3)

CO - PO MAPPING:

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

SEMESTER - II

20ESCE201 SDG NO. 4, 9, 12	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I STATICS OF PARTICLES **10**

Introduction – Units and Dimensions – Laws of Mechanics –Newton's laws-Lami's theorem- Parallelogram, triangular Law and polygon law of forces-Principle of transmissibility-Vectorial representation of forces – fundamental vector operations of forces–free body diagram- Equilibrium of a particle in 2 D – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces.

UNIT II EQUILIBRIUM OF RIGID BODIES 10

Moments and Couples - Vectorial representation– Scalar components of a moment – Varignon's theorem- Moment of a force about a point and about an axis- Single equivalent force-Types of supports –Action and reaction forces – types of equilibrium -Equilibrium of Rigid bodies in two and three dimensions.

UNIT III FRICTION 7

Friction force – types of friction-laws of Coulomb friction – simple contact friction-two bodies in contact- wedge friction, ladder friction- Rolling resistance.

UNIT IV PROPERTIES OF SURFACES AND SOLIDS 9

Centroids and centre of mass and volume – Simple and composite areas and solids -Theorems of pappus - Area moments of inertia of composite areas – Parallel axis theorem and perpendicular axis theorem – polar moment of inertia-radius of gyration-product of inertia-Principal moments of inertia of plane areas and composite areas – Principal axes of inertia-Mass moment of inertia – prismatic, cylindrical and spherical solids from first principle.

UNIT V DYNAMICS OF PARTICLES AND RIGID BODIES 9

Displacement, Velocity and acceleration – Relative motion - Curvilinear motion - Newton's laws of motion – D' Alembert's principle, Work Energy principle - Impulse and Momentum – Impact of elastic bodies. Rigid body motion-Translation and Rotation– General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi, 2004.
2. N.H Dubey, "Engineering Mechanics – Statics and Dynamics", McGraw Hill Education (India) Pvt Ltd.
3. Vela Murali, "Engineering Mechanics", Oxford University Press, 2010.

REFERENCES

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna MohanaRao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.

4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics andDynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
6. Dr.N.Kottiswaran, Engineering Mechanics (statics and Dynamics), Sri Balaji Publications, Erode.

WEB RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105164/
2. https://nptel.ac.in/courses/112/103/112103109/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112/106/112106286/
2. https://nptel.ac.in/courses/112/103/112103108/
3. https://nptel.ac.in/courses/112/106/112106180/
4. https://www.coursera.org/learn/engineering-mechanics-statics

OUTCOMES:

Upon completion of the course, the students should be able to

1. Enumerate the basic concepts and laws of mechanics and solve problems on the Equilibrium of particles. (K2)
2. Understand the basic concepts of moments and couple and equilibrium of rigid bodies. (K3)
3. Evaluate centroid, area and mass moment of inertia, product of inertia and principal Moment of inertia for different surfaces and solids. (K4)
4. Understand the influence of friction between contact surfaces. (K3)
5. Apply the concepts of kinematics and kinetics on particles and rigid bodies. (K3)
6. Predict the effect of Forces on a particle and rigid bodies (K4)

CO - PO, PSO MAPPING :

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

SEMESTER - II

20ESGE201 SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering

ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.

4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE

Welding:

1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2. Gas welding practice.

Basic Machining:

1. Simple Turning and Taper turning.
2. Drilling Practice.

Sheet Metal Work:

1. Forming & Bending.
2. Model making – Trays and funnels.
3. Different type of joints.

Machine assembly practice:

1. Study of centrifugal pump.
2. Study of air conditioner.

Demonstration on:

1. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2. Foundry operations like mould preparation for gear and step cone pulley.
3. Fitting – Exercises – Preparation of square fitting and V – fitting models.

Total : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. Electrical

1	Assorted electrical components for house wiring	15 Sets
2	Electrical measuring instruments	10 Sets

3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 Each
4	Megger (250V/500V)	1 No
5	Power Tools: Range Finder Digital Live-wire detector	 2 Nos 2 Nos

2. Electronics

1	Soldering guns	10 Nos
2	Assorted electronic components for making circuits	50 Nos
3	Small PCBs	10 Nos
4	Multimeters	10 Nos

3. Civil

1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2	Carpentry vice (fitted to work bench)	15 Nos
3	Standard woodworking tools	15 Sets
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools: Rotary Hammer Demolition Hammer Circular Saw Planer Hand Drilling Machine Jigsaw	 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos 2 Nos

4. Mechanical

1	Arc welding transformer with cables and holders	5 Nos
2	Welding booth with exhaust facility	5 Nos
3	Welding accessories like welding shield, chipping hammer, wire brush, etc	5 Sets
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5	Centre lathe	2 Nos
6	Hearth furnace, anvil and smithy tools	2 Sets
7	Moulding table, foundry tools	2 Sets
8	Power Tool: Angle Grinder	2 Nos
9	Study-purpose items: centrifugal pump, air-conditioner	1 each

OUTCOMES:

Upon completion of the course, the students should be able to

1. Elaborate on the components, gates, soldering practices. Calculate electrical parameters such as voltage, current, resistance and power. (K1)
2. Design and implement Rectifier and Timer circuits (K2)
3. Measure the electrical energy by single phase and three phase energy meters. (K2)
4. Prepare the carpentry and plumbing joints. (K2)
5. Perform different types of welding joints and sheet metal works (K2)
6. Perform different machining operations in lathe and drilling. (K2)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Co1	3	2	1	1	2	1	-	-	1	1	1	1
CO2	3	2	1	1	2	1	-	-	1	1	1	1
CO3	2	2	1	1	1	1	-	-	1	1	1	1
CO4	1	1	1	-	-	2	-	-	1	1	1	2
CO5	2	1	1	-	-	1	1	1	1	1	1	2
CO6	2	1	1	-	-	1	-	1	1	1	1	2

SEMESTER - II

20CEPL201 SDG NO. 4, 9	COMPUTER AIDED BUILDING DRAWING	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To impart knowledge and skill relevant to Building and Structural detailed drawing using computer software

LIST OF EXPERIMENTS

1. Principles of planning and orientation
2. Buildings with load bearing walls and RCC roof (Plan, section, elevation)
3. Buildings with sloping roof.
4. Industrial buildings – North light roof truss
5. Building information modeling.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity
1.	Models of Structures	1 each
2.	Computers Pentium IV	30 Nos
3.	CADD Software - Minimum 5 user License	1 No

OUTCOMES:

Upon completion of the course, the student should be able to

1. Prepare simple layout of buildings. (K3)
2. Produce working drawings for individual components like doors and windows etc. (K3)
3. Develop line diagram, building section, elevation, key plan and sectional elevation. (K3)
4. Illustrate hand drafting any parts of a building and implement the regulations for layout of plan. (K3)

CO - PO MAPPING:

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

SEMESTER - II

20TPHS201 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the nuances in resume building
- To explore various virtual meeting tools
- To gain knowledge about online certification courses
- To develop knowledge in Google Suite products
- To enhance presentation skills

UNIT I RESUME BUILDING **6**

Your Strength, Projects, Internship, Paper Presentation, uploading your coding in github, Introduction to HackerRank, HackerEarth virtual online assessment (Auto Proctored) (Practicals - Construct a resume, Register for a online Mock Assessment / Contest)

UNIT II VIRTUAL MEETINGS **6**

Basic Etiquette of virtual meeting – Introduction to Skype - Zoom - Webex - Google Meet - Gotowebinar - Jio meet – Screen Share - Jamboard - Feedback polling - Chatbox

(Practicals - Accept and Register for a mock class to attend - How to host a meeting).

UNIT III ONLINE LEARNING **6**

Online Certification - Coursera – Udemy – Edx – Cisco – Online Practice Platforms - SkillRack – Myslate - FACEprep - BYTS - aptimithra - Contest Registrations - TCS Campus Commune - HackwithInfy, InfyTQ - Virtusa NurualHack - Mindtree Osmosis – Online assessment - AMCAT-PGPA.

(Practicals - Campus Commune Registration , Coursera registration - Mock Registration (KAAR Technologies as sample).

UNIT IV GOOGLE SUITE **8**

Define google suite - Benefits of google suite - Google Search - Sheet - Docs - Forms - Calender - Drive - Slide - Translate - Duo - Earch - Maps - Hangouts- Sites - Books - Blogger

(Practicals – Create google sheets and share - Create google Forms and share, Create Google Slide and share , Google drive creation and share (Knowledge of Rights), Create poll and share.

UNIT V PRESENTATION SKILLS **4**

Email Writing – Group Discussion - Power Point Presentation

(Practicals- Create a self SWOT Analysis report. A PowerPoint Slide Preparation)

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Resume Building:

1. https://zety.com/blog/resume-tips
2. https://resumegenius.com/blog/resume-help/how-to-write-a-resume
3. https://www.hackerearth.com/recruit/
4. https://www.hackerrank.com/about-us

Unit – II:Virtual Meetings

1. https://www.claphamschool.org/our-community/blog/online-learning-etiquette-guide-14-principles-to-guide-students
2. https://online.hbs.edu/blog/post/virtual-interview-tips?c1=GAW_SE_NW&source=IN_GEN_DSA&cr2=search__-__nw__-__in__-__dsa__-__general&kw=dsa__-__general& cr5=459341920955&cr7=c&gclid=Cj0KCQjw8fr7BRDSARIsAK0Qqr4dRRbboL3kltrwDsr7hm8oIHtN5dfjD3NIFZULuzNwEXxhjpNFQ2caApn5EALw_wcB
3. https://hygger.io/blog/top-10-best-group-meeting-apps-business/
4. https://www.zdnet.com/article/best-video-conferencing-software-and-services-for-business/

Unit – III:Online Learning

1. https://www.coursera.org/browse
2. https://support.udemy.com/hc/en-us/articles/229603868-Certificate-of-Completion
3. https://www.edx.org/course/how-to-learn-online
4. https://www.cisco.com/c/en/us/training-events/training-certifications/certifications.html
5. https://campuscommune.tcs.com/en-in/intro
6. https://www.freshersnow.com/tcs-campus-commune-registration/
7. https://www.infosys.com/careers/hackwithinfy.html
8. https://www.mindtree.com/blog/osmosis-2013-my-experiences
9. https://www.myamcat.com/knowing-amcat
10. https://www.admitkard.com/blog/2020/02/06/amcat/

Unit IV: Google Suite

1. https://www.inmotionhosting.com/blog/what-is-g-suite-and-why-should-i-consider-using-it/
2. https://en.wikipedia.org/wiki/G_Suite
3. https://blog.hubspot.com/marketing/google-suite
4. https://kinsta.com/blog/g-suite/

Unit V: Presentation Skills

1. https://www.mindtools.com/CommSkll/EmailCommunication.htm
2. https://www.grammarly.com/blog/email-writing-tips/
3. https://business.tutsplus.com/articles/how-to-write-a-formal-email--cms-29793
4. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
5. https://www.mbauniverse.com/group-discussion/tips
6. https://slidemodel.com/23-powerpoint-presentation-tips-creating-engaging-interactive-presentations/
7. https://business.tutsplus.com/articles/37-effective-powerpoint-presentation-tips--cms-25421
8 https://blog.prezi.com/9-tips-on-how-to-make-a-presentation-a-success/
9. http://www.garrreynolds.com/preso-tips/design/

OUTCOMES:

On completion of this course, the student should be able to

1. Construct a suitable resume and registration procedure for online mock assessments. (K1)
2. Handle various virtual meeting tools. (K3)
3. Acquire exposure about online certification courses. (K4)
4. Get involved and work in a collaborative manner. (K2)
5. Gain knowledge in various presentation methodologies. (K1)
6. Apply knowledge to practice Google suite features and SWOT analysis. (K3)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Co1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - II

20HSMG201 SDG NO. 4 & 5	INTERPERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I INTERPERSONAL VALUES **6**

Interpersonal Relationships and Values – Importance and Barriers – Building and maintain relationships – Mutual understanding – Respect to others.

UNIT II EFFECTIVE COMMUNICATION **6**

Communication skills –Importance and Barriers - Impressive formation and management – Public speaking

UNIT III GROUP DYNAMICS **6**

Group formation –Teamwork – Identify others attitude and behaviour – Formation of relationship – Personal and professional.

UNIT IV MUTUAL RELATIONSHIP **6**

Building mutual understanding and cooperation – Enhancing decision making skills – Problem solving skills – Comparative Appraisal – Interpersonal needs.

UNIT V POSITIVE ATTITUDE **6**

Fostering trust and cooperation – Developing and maintain positive attitude – Improving socialization – Development of security and comfort.

TOTAL: 30 PERIODS

Note: Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development", McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop a healthy relationship & harmony with others. (K1)
2. Practice respecting every human being. (K3)
3. Practice to eradicate negative temperaments. (K3)
4. Acquire Respect, Honesty, Empathy, Forgiveness and Equality. (K4)
5. Manage the cognitive abilities of an Individual. (K5)
6. Understanding the importance of public speaking and teamwork. (K2)

CO – PO MAPPING :

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

SEMESTER - III

20BSMA301 SDG NO. 4	LINEAR ALGEBRA, PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- The aim of this course is to impart knowledge in the concepts of linear algebra as a prerequisite for the recent thrust areas of technological advancement
- To know the importance of partial differential equations in modeling various engineering problems
- To introduce the techniques of Fourier transform and Z- Transforms to analyze continuous and discrete signals

UNIT I VECTOR SPACES 15

Vector spaces – Subspaces – Linear combinations– Linear independence and linear dependence – Bases and dimensions.

UNIT II LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 15

Linear transformation - Null and range spaces - Dimension theorem (Statement only) - Matrix of a linear transformation - Inner product - Norm - Gram Schmidt orthogonalization process.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT IV FOURIER TRANSFORMS 9

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9

Z-transforms - Elementary properties – Inverse Z-transform (using partial fractions and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. Friedberg A.H., Insel A.J. and Spence L., "Linear Algebra", Prentice Hall of India, New Delhi, 2004. Unit I (Sec. 1.2, 1.3, 1.4 (linear combinations only), 1.5 & 1.6), Unit II (Sec. 2.1, 2.2, 6.1 & 6.2) (In Units I & II to include theorem statements only).
2. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, New Delhi. Unit III (Sec. 1.2, 1.5, 1.7, 1.11, 1.13, 1.14), Unit IV (Sec. 4.1, 4.2, 4.3, 4.6), Unit V(Sec. 5.1, 5.2, 5.3, 5.4, 5.5).

REFERENCES:

1. Strang G., "Linear Algebra and its applications", Thomson (Brooks/Cole), New Delhi, 2005.
2. Lay D. C., "Linear Algebra and its Applications", 5th Edition, Pearson Education, 2015.
3. Kumaresan S., "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
4. James G., "Advanced Modern Engineering Mathematics", Pearson Education, 2007.
5. O'Neil, P.V., "Advanced Engineering Mathematics", Cengage Learning, 2011.

WEB RESOURCES

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
2. https://nptel.ac.in/courses/111/106/111106135/
3. https://nptel.ac.in/courses/111/103/111103021/

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra
2. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebr a-spring-2010/video-lectures/
3. https://freevideolectures.com/course/3244/advanced-engineering-mathematics

OUTCOMES:

Upon completion of the course, the students should be able to

1. Identify a vector space, subspace and construct the basis and dimension of a vector space. (K3)
2. Compute the rank and nullity of a linear transformation and construct an orthonormal basis using the Gram Schmidt orthogonalization process. (K3)

3. Solve first order linear partial differential equations and higher order homogeneous and non - homogeneous partial differential equations. (K3)
4. Find Fourier transforms and Fourier sine and cosine transforms of simple functions. (K3)
5. Solve difference equations using Z-transforms. (K3)

CO - PO MAPPING:

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

SEMESTER - III

20CEPC301 SDG NO. : 4 & 9	STRENGTH OF MATERIALS I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamental concepts of Stress, Strain and deformation of solids
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations
- To understand the effect of torsion on shafts and springs
- To analyze plane and spacetrusses

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method

UNIT II TRANSFER OF LOADS AND STRESSES IN BEAMS 9

Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending

moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams - Leaf Springs.

UNIT III DEFLECTION OF BEAMS **9**

Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT IV TORSION **9**

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel – Design of buffersprings.

UNIT V ANALYSIS OF TRUSSES **9**

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

TOTAL: 45PERIODS

TEXT BOOKS:

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, "SMTS –I Strength of Materials", Laxmi publications. New Delhi, 2015.
3. Rattan . S. S, "Strength of Materials", Tata McGraw Hill Education Private Limited, New Delhi, 2012.
4. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010.

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi 1999.
2. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1995.
3. Basavarajaiah, B.S. and Mahadevappa, P., "Strength of Materials", Universities Press, Hyderabad,2010.
4. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi,2009

WEB REFERENCES:

1. https://nptel.ac.in/courses/105105108/
2. https://www.ndl.gov.in/
3. http://www.brainkart.com/subject/Strength-of-Materials_75/
4. https://en.wikibooks.org/wiki/Strength_of_Materials

ONLINE RESOURCES:

1. https://freevideolectures.com/course/92/mechanics-of-solids
2. https://swayam.gov.in/nd1_noc19_ce18/preview
3. http://www.nptelvideos.com/mechanical/strength_of_materials.php
4. https://www.classcentral.com/course/mechanics-1-5031
5. https://ekeeda.com/subject/strength-and-mechanics-of-materials

OUTCOMES:

Upon completion of the course, the student should be able to

1. Calculate the stresses , strains and deformation of solids. (K2)
2. Compute the Stress in two dimensions, Stresses on inclined planes, Principal stresses and strains. (K3)
3. Determine the Shear force, bending moment and Stress Distribution for Determinate Structures. (K3)
4. Apply the Double Integration, Moment Area, Macaulay and Conjugate beam Method for computing slope and deflection for Determinate Structures. (K3)
5. Analyze the effect of torsion on shafts and springs (K3)
6. Determine the forces developed in pin jointed planes and space trusses by method of joints, method of sections and tension coefficient method. (K3)

CO- PO,PSO MAPPING:

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

SEMESTER - III

20CEPC302 SDG NO. 4,9	PLANE AND GEODETIC SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the various methods of plane and geodetic surveying for solve the real world problems

UNIT I FUNDAMENTALS OF SURVEYING **9**

Classifications and basic principles of surveying – Equipment and accessories for ranging and chaining – Basic principles Compass surveying - Plane Table Surveying accessories and methods - Levels and staves - Methods of levelling - Booking - Reduction – Curvature and refraction correction.

UNIT II THEODOLITE SURVEYING AND COMPUTATIONS **9**

Horizontal and vertical angle measurements by Theodolite – Heights and distances – Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contouring – Characteristics of contours – Methods of contouring – Interpolation of contours - Contour gradient – Uses of contour plan and map

UNIT III CONTROL SURVEYING AND ADJUSTMENT **9**

Horizontal and vertical control- Methods – Triangulation - satellite stations – reduction to centre - Trigonometric levelling - single and reciprocal observations - Traversing – Gale's table - Trilateration - Concepts of measurements and errors – adjustment methods – least square methods – angles, lengths and levelling network.

UNIT IVMODERN SURVEYING **9**

Total Station: Digital Theodolite, EDM, Electronic field book - Advantages – Parts and accessories - working principle – Observables – Errors - COGO functions – Field procedure and applications. GPS: Advantages - System components – Signal structure – Selective availability and antispoofing – receiver components and antenna – Planning and data acquisition – Data processing - Errors in GPS – Field procedure and applications.

UNIT V MISCELLANY **9**

Route Surveying - Reconnaissance - Route surveys for highways, railways and waterways - Simple curves – Compound and reverse curves – Transition curves - Setting out different methods of simple curve - Vertical curves -

Hydrographic surveying – Tides - MSL - Sounding methods - Three-point problem - Astronomical terms and definitions - Celestial coordinate systems – different time systems - Field observations and determination of azimuth by altitude and hour angle method.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. T.P.Kanetkar and S.V.Kulkarni, "Surveying and Levelling", Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, "Surveying Vol. I & II", Lakshmi Publications Pvt Ltd, New Delhi, 2005.

REFERENCES:

1. R. Subramanian, "Surveying and Levelling", Oxford University Press, Second Edition, 2012.
2. Bannister and S. Raymond, "Surveying", Seventh Edition, Longman 2004.
3. S.K. Roy, "Fundamentals of Surveying", Second Edition, Prentice' Hall of India 2004.
4. K.R. Arora, "Surveying Vol I & II", Standard Book house , Twelfth Edition. 2013.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://www.britannica.com/technology/surveying
3. http://egyankosh.ac.in/handle/123456789/39480
4. https://www.isro.gov.in/spacecraft/satellite-navigation

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104101/
2. https://www.gps.gov/multimedia/launchvideos/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the rudiments, various instruments and accessories involved in conventional surveying such as chain surveying & compass surveying (K2)
2. Apply the knowledge of Plane table surveying and Levelling in the field work (K3)
3. Apply the concepts of Theodolite Surveying, Tacheometric surveying. Heights & distances and Contouring in field observations and computations (K3)

4. Understand the procedure for establishing horizontal and vertical control and determine the errors and most probable values of field observations by using various methods like normal equation. method of correlates and least square (K3)
5. Acquire knowledge on Modern Surveying such as Total station and GPS in the field work (K2)
6. Derive basic knowledge in Route surveying. Hydrographic surveying, Curve surveying and Field Astronomical surveying (K3)

CO- PO, PSO MAPPING:

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

SEMESTER - III

20CEPC303 SDG NO. 4,6,9,14	FLUID MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To familiarize with the properties of fluids and the applications of fluid mechanics
- To formulate and analyze problems related to calculation of forces in fluid structure interaction
- To understand the concept of fluid measurement, types of flows and dimensional analysis

UNIT I FLUIDS PROPERTIES AND FLUID STATICS **10**

Scope of fluid mechanics-Definitions of a fluid-Methods of analysis–Continuum hypothesis - System and Control volume approach–Fluid properties-Fluid statics–Manometry-Forces on plane and curved surfaces-Buoyancy and floatation- Stability of floating bodies.

UNIT II BASIC CONCEPTS OF FLUID FLOW **10**

(a) Kinematics-Classification of flows-Stream line, streak-line and path-lines-Stream function and velocity potentials- Flow nets;

(b) Dynamics - Application of control volume to continuity, energy and momentum -Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements-Linear momentum equation–Application to Pipe bends-Moment-of- momentum equation.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES **7**

Fundamental dimensions-Dimensional homogeneity-Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters-Similitude and model studies-Distorted and undistorted models.

UNIT IV INCOMPRESSIBLE VISCOUS FLOW **10**

Reynolds experiment-Laminar flow in pipes and between parallel plates - Development of laminar and turbulent flows in pipes-Darcy-Weisbach equation-Moody diagram-Major and minor losses of flowinpipes- Pipes in series and parallel–Equivalent pipes.

UNIT V BOUNDARY LAYERS **8**

Definition of boundary layers-Laminar and turbulent boundary layers-Displacement, momentum and energy thickness- Momentum integral equation- Applications.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Streeter, V.L.Wylie, E.B. and Bedford K. W, "Fluid Mechanics", Tata Mc GrawHill, New Delhi, 9th Edition, 1998.
2. Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 2003.

REFERENCES:

1. SKSom; GautamBiswas and S Chakraborty, "Introduction to Fluid Mechanics and Fluid Machines", Tata Mc Graw Hill Education Pvt.Ltd., 2012.
2. Pani B S, "Fluid Mechanics: A Concise Introduction", Prentice Hall of India Private Ltd, 2016.
3. JainA.K. "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, NewDelhi, 2014.
4. Narayana Pillai N. "Principles of Fluid Mechanics and Fluid Machines", (3rd.Ed.) University Press(India) Pvt.Ltd.2009.

WEB REFERENCES:

1. http://web.mit.edu/hml/ncfmf.html
2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/
3. https://nptel.ac.in/courses/105103095/

ONLINE RESOURCES:

1. https://www.classcentral.com/course/swayam-introduction-to-boundary-layers-5291
2. Mechanical - Introduction to Fluid Mechanics and Fluid Engineering - YouTube.
3. https://nptel.ac.in/courses/112105269/
4. https://cosmolearning.org/courses/fluid-mechanics/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Study the basic properties of fluids and apply Newton's Law of Viscosity in solving practical problems. (K2)
2. Investigate the basic principles of fluid statics and implement the hydrostatic law to determine the forces on surfaces and hydraulic structures, floatation and stability of the floating bodies (K2)
3. Fixing problems related to equations of motion and exhibiting the use of flow measuring devices (K2)
4. Construct mathematical correlation considering dimensionless parameters and apply model laws to predict the performance of prototype (K2)
5. Explain the concept of various losses in pipe flow and resolving the problems using Darcy's equation and Hagen poiseulle's equation to analyze the laminar flow (K2)
6. Understanding the boundary layer theory and solving problems using momentum integral equation (K2)

CO - PO, PSO MAPPING :

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

SEMESTER - III

20CEPC304 SDG NO. 4,9	CONSTRUCTION MATERIALS, EQUIPMENTS & PRACTICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the classifications, manufacturing, various tests, properties and uses of stones, bricks, concrete blocks and lime
- To understand the manufacturing, applications, various mechanical and chemical properties of cement and aggregates
- To acquire basic concepts on tests, types and knowledge of concrete mix designs, specifications and ready mix concrete
- To learn the classifications and applications of timber, aluminium and various modern materials
- Recognize and acquire knowledge on the good practices adapted in the construction field

UNIT I STONES-BRICKS - CONCRETE BLOCKS-LIME 9

Stone as building material - criteria for selection-Tests on stones – Bricks - Classification - Manufacturing of clay bricks –Tests on bricks - Compressive strength -Water Absorption- Efflorescence - Bricks for special use-Lime-Preparation of lime mortar – Concrete hollow blocks- Lightweight concrete blocks.

UNIT II CEMENT-AGGREGATES 9

Cement – Ingredients - Manufacturing process - Types and grades - Properties of cement and Cement mortar- Tests on Cement - Fineness - Soundness, Consistency – Setting time - Coarse Aggregate –Crushing strength - Impact strength - Flakiness Index – Elongation Index - Abrasion resistance- Grading – Fine aggregate - grading – Bulking.

UNIT III CONCRETE 9

Concrete - Ingredients - Hydration-Batching plants –RMC – Properties of fresh concrete - Slump, Flow and Compaction factor - Properties of Hardened concrete - Compressive, Tensile and Shear strength-Modulus of rupture tests – Non-destructive testing-Mix Specification - Concept and design of mix proportion – BIS method - High strength concrete and HPC – Self compacting concrete.

UNIT IV TIMBER AND OTHER MATERIALS **9**

Timber - Market forms - Plywood - Veneer - False ceiling materials - Laminates - Steel - Mechanical treatment-Aluminum-Uses-Market forms- Glass - Refractories-Composite Materials-FRP

UNIT V CONSTRUCTION PRACTICES &SERVICE REQUIREMENTS **9**

Types of Foundations - Shallow and Deep Foundations-Brick Masonry – Plastering and Pointing - Cavity Walls – Diaphragm Walls – Formwork –Centering and Shuttering – Shoring – Scaffolding – Underpinning –Roofing – Flooring – Joints in concrete – Contraction / Construction / Expansion joints – Fire Protection - Thermal Insulation – Ventilation and Air conditioning –Acoustics and Sound Insulation - Damp Proofing

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Varghese.P.C, "Building Construction", Second Edition PHI Learning Ltd., 2016.
2. Shetty.M.S., "Concrete Technology (Theory and Practice)", S Chand and Company Limited, 2015.

REFERENCES:

1. Arora S.P and Bindra S.P, "Building Construction", Dhanpat Rai and Sons, 1997.
2. Punmia, B.C., "Building Construction", Laxmi Publication (P) Ltd.., 2008.
3. Neville A.M., "Properties of Concrete", fourth edition, Pearson education Ltd. 2012.
4. Peurifoy R.L., Schexnayder, C.J., Shapira A., Schmitt. R., "Construction Planning Equipment and Methods", Tata McGraw-Hill, 2011.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105102088/
2. https://swayam.gov.in/nd1_noc20_ce01/preview
3. https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2330

ONLINE RESOURCES:

1. http://www.infocobuild.com/education/
2. https://freevideolectures.com/course/3516/modern-construction-materials

OUTCOMES

Upon completion of the course, the students should be able to

1. To understand the classifications , manufacturing, various tests, properties and uses of stones, bricks , concrete blocks and lime (K2)
2. To understand the manufacturing, applications, various mechanical and chemical properties of cement and aggregates (K2)
3. To acquire basic concepts on tests ,types and knowledge of concrete mix designs, specifications and ready mix concrete (K1)
4. To learn the classifications and applications of timber, aluminium and various modern materials. (K1)
5. Recognize and acquire knowledge on the good practices adapted in the construction field (K2)
6. Acquire knowledge on the service requirements adapted in the construction acquire knowledge on the service requirements adapted in the construction (K1)

CO – PO, PSO MAPPING:

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

SEMESTER - III

20CEPC305 SDG NO. 4,9,11,15	ENGINEERING GEOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- This course will familiarize the students on the role and importance of geology in civil engineering, apart from learning the methods of surface and subsurface investigations using geological, geophysical and remote sensing methods

UNIT I INTRODUCTION AND GEOMORPHOLOGY 9

Significance of Geology in Civil Engineering; Internal structure of the Earth; Surface geologic processes in: Hilly terrains, Plains, Deserts and Coastal regions; physiographic forms and drainage patterns.

UNIT II MINERALS AND ROCKS 9

Physical and Chemical properties of minerals. Properties of Quartz, Feldspar, Mica, Olivine, Pyroxene, Amphibole. Reactivity of alkaline minerals with cement and sand. Origin, texture, structure and petrography of: Hard rocks – Igneous and Metamorphic (Granite, Basalt, Dolerite, Gneiss, Quartzite, Schist, Slate, Marble); Soft rocks – Sedimentary (Sandstone, Limestone, Shale/clay).

UNIT III STRUCTURAL GEOLOGY AND GEOTECHNICAL PROPERTIES OF ROCKS 9

Attitude of rocks – Dip, Strike measurement of attitude and thickness of rock beds. Relevance to civil engineering. Overview of folds, fractures, faults, joints in rocks. Relevance to civil engineering. Introduction to index properties of rocks- strength- structures and discontinuities in rocks, Geological factors controlling the strength of rock – weathering (process and grades); influence on strength of rocks. Rock Mass Rating (RMR), Rock Quality Designation (RQD), Geological Strength Index (GSI), Q system for rock mass classification.

UNIT IV SURFACE AND SUB-SURFACE GEOLOGICAL INVESTIGATIONS 9

Reconnaissance surface investigation – Geological mapping; remote sensing and field surveys for geological mapping. Overview of Geophysical methods - Electrical, Seismic, GPR. Applications for sub-surface investigation and groundwater exploration. Borehole core logging and interpretation to characterize weathering grade, strength, colour, hydroproperties, RMR, RQD, GSI and Q parameters.

UNIT V GEOLOGICAL CONSIDERATIONS FOR ENGINEERING STRUCTURES AND GEOHAZARDS 9

Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels and Road cuttings. Coastal protection. Earthquake – Seismic zones of India, Landslides – causes and mitigation. Tsunami – causes and mitigation. Case studies from India.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Varghese, P.C., "Engineering Geology for Civil Engineering PHI Learning", Private Limited, New Delhi, 2012.
2. Parbin Singh, "A Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.

REFERENCES:

1. F.G.Bell. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
2. P Venkatareddy. D., "Engineering Geology", Vikas Publishing House Pvt. Ltd. 2010.
3. Parbin Singh, "A Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.
4. KVGK Gokhale, "Principles of Engineering Geology", BS Publications, Hyderabad 2011.
5. N. Chenna Kesavulu, "Textbook of Engineering Geology", Macmillan India Ltd., 2009.

WEB REFERENCES:

1. https://geology.com/
2. https://geologyscience.com/
3. https://webmineral.com/
4. https://blog.feedspot.com/geology_blogs/
5. https://www.nationalgeographic.org/
6. https://www.thoughtco.com/geology-4133564

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105106/
2. http://www.bbc.com/earth/tags/geology
3. https://www.ted.com/topics/geology

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the internal structure of the earth and the action of various geological agencies, related processes and physiographic forms. (K2)
2. Comprehend the physical and chemical properties of minerals and their influence on engineering properties of construction materials. (K2)
3. Derive knowledge about the origin, texture, structure, petrography and engineering properties of various types of rocks. (K2)
4. Interpret the structural features. index & geotechnical properties of rocks and their relevance to Civil engineering. (K2)
5. Apply the knowledge of geological mapping, remote sensing, geophysics and borehole logging for surface and subsurface geological investigations. (K2)

6. Assess the geological conditions necessary for design and construction of engineering structures & study the causes, effects and mitigation of geo hazards. (K2)

CO- PO, PSO MAPPING :

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

SEMESTER - III

20CEPL301 SDG NO. 4&9	PLANE AND GEODETIC SURVEYING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To familiarize with the various surveying instruments and methods

LIST OF EXPERIMENTS

1. Determination of distance between two points by ranging and chaining
2. Determination of area of a field by Cross staff survey
3. Compass traversing - Computation of Included angle after adjustment of Local Attraction
4. Planimetric mapping of an area using Plane table surveying (Radiation, Intersection)
5. Fly leveling using dumpy level.
6. Check Levelling.
7. Contour Mapping using Grid Levelling.
8. Study of Theodolite & Angle Observations by Repetition and Reiteration methods
9. Determination of elevation of an object using single plane method when base is accessible/inaccessible.
10. Determination of Tacheometric Constants

11. Heights and distances by Stadia & Tangential Tacheometry.
12. Study of Total Station

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

S. No.	EQUIPMENTS	
1	Total station	1 no.
2	Theodolite	Atleast 1 for every 5 students
3	Dumpy level	Atleast 1 for every 5 students
4	Plane table	Atleast 1 for every 5 students
5	Ranging rods	1 for a set of 5 students
6	Levelling staff	1 for a set of 5 students
7	Cross staff	1 for a set of 5 students
8	Chains	1 for a set of 5 students
9	Tapes	1 for a set of 5 students
10	Arrows	1 for a set of 5 students
11	Prismatic compass	10 nos.
12	Surveyor's compass	5 nos.

OUTCOMES

On completion of this laboratory course, the student should be able to

1. Use conventional surveying tools such as chain/tape, compass, plane table in the field of civil engineering applications. (K2)
2. Apply the concept of levelling in civil engineering works and determine the reduced level of various points.(K3)
3. Impart knowledge in computation of Heights & Distances using horizontal and vertical angles in Theodolite and Tacheometric surveying. (K3)
4. Acquire practical knowledge on handling modern survey instruments like Total Station. (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Co1	1	1	1	-	2	2	-	-	2	-	-	1	-	-
CO2	2	1	1	-	2	2	-	-	2	-	-	1	-	-
CO3	2	1	2	-	3	2	-	-	3	-	-	1	-	-
CO4	1	1	2	-	3	1	-	-	3	-	-	2	-	-

SEMESTER - III

20CEPL302 SDG NO. 4,8,9	CONSTRUCTION MATERIAL LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To facilitate the understanding of the behavior of construction materials

I. TEST ON CEMENT

1. Determination of fineness
2. Determination of consistency
3. Determination of initial and final setting time
4. Determination of specific gravity

II.TEST ON FINE AGGREGATES

1. Grading of fine aggregates
2. Test for specific gravity
3. Compacted and loose bulk density of fine aggregate

III. TEST ON BRICKS

1. Test for compressive strength
2. Test for Water absorption
3. Determination of Efflorescence

IV. TEST ON COARSE AGGREGATE

1. Determination of specific gravity
2. Determination of impact value
3. Determination of elongation index
4. Determination of flakiness index
5. Determination of aggregate crushing value

V. TEST ON CONCRETE

1. Test for slump
2. Test for Compressive strength

TOTAL: 60 PERIODS

REFERENCES:

1. Construction Materials Laboratory Manual, Anna University, Chennai-25.
2. IS 4031 (Part1)–1996– Indian Standard Codes.
3. IS 4031 (Part3 and Part5)–1988
4. IS 2386(Part1 to Part6)–1963
5. IS 383–2016 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

S.No	Equipments	Quantity
1	Vicats apparatus	4 nos
2	Le-Chateleier Apparatus	4 nos
3	Slump test apparatus	6 nos
4	Compaction factor apparatus	4 nos
5	Vee Bee consistomter	4 nos
6	Flow table Apparatus	2 nos
7	C T M	1 no
8	Sieve-Shaker	1 set
9	Sieve set	2 nos
10	Las Angels Abrasion Testing Apparatus	1 no
11	Impact testing machine	1 no
12	Pyconometer	3 nos

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Find the fineness, specific gravity, initial and final setting time of cement. (K2)
2. Find the Physical and Mechanical properties of fine aggregate and Coarse aggregate. (K2)
3. Find the compressive strength, water absorption and efflorescence of bricks. (K2)
4. Find the slump of fresh concrete and compressive strength of hardened concrete. (K2)

CO- PO, PSO MAPPING :

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

SEMESTER - III

20CETE301 SDG NO. 4,11&15	LIVE-IN-LAB - I	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To enable hands-on experience in the electronics hardware/Software domain
- To enable development of skill set for designing and realizing prototype electronic systems/simulation model

COURSE METHODOLOGY

- This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
- The project work must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.
- Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project.
- On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION

- First evaluation (Immediately after first internal examination) : 20 marks
- Second evaluation (Immediately after second internal examination): 30marks
- Final evaluation Last week of the semester) : 50marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

1. List the problems and conduct literature survey to identify the gap and come up with an application oriented research problem in the specific domain.(K1)
2. Understand the project characteristics and explore necessary tools and components needed at various stages of the project(K2)
3. Design and validate the proposed system using simulation.(K3)
4. Develop the Prototype of the proposed system by adapting Industrial safety standards and best financial management practices(K5)
5. Analyze the obtained results and prepare a technical report.(K4)
6. Evaluate the project and go for journals and patents publication.(K5)

CO- PO & PSO MAPPING:

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

SEMESTER - III

20CETP301 SDG NO. 4	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

COURSE OBJECTIVE:

- To educate and enrich the students on quantitative ability, reasoning ability, and verbal ability.

UNIT I QUANTITATIVE ABILITY – I **6**

Problems on Trains, Time and Distance, Height and Distance, Time and Work

UNIT II QUANTITATIVE ABILITY – II **6**

Problems on Ages, Alligation or Mixture, Chain Rule, Simple Interest, Simple Equation, Theory Of Equation

UNIT III REASONING ABILITY – I **6**

Analytical Reasoning, Pipes and Cistern, Logical Problems, Logical Games, Logical Deduction, Data Sufficiency, Arithmetic Reasoning

UNIT IV VERBAL ABILITY – I **6**

Idioms & Phrases, Synonyms, Antonyms, Classification

UNIT V CREATIVITY ABILITY – I **6**

Venn Diagrams, Cube and Cuboids, Dice, Cubes and Dice, Figure Matrix

TOTAL : 30 PERIODS

REFERENCES:

1) Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2) Quantum CAT by Sarvesh Verma
3) A Modern Approach to Logical Reasoning by R. S. Agarwal
4) Verbal Ability and Reading Comprehension by Arun sharma

FUNDAMENTALS OF FIELD EXECUTION IN CIVIL ENGINEERING – PHASE 2

COURSE OBJECTIVE:

- To provide exposure to problem-solving through programming.
- To train the student to the basic concepts of the C-programming language.
- To provide exposure to problem-solving through programming.
- To create exposure to students on the basic concepts of Field execution in Civil Engineering
- To impart knowledge in executing structural, finishing and handing over works

UNIT I INTRODUCTION TO PRINCIPLES OF PROGRAMMING 6

Introduction to Programming , Programing Domain : Artificial Intelligence, Systems Programming, Assembly Level Languages, Problem solving using Algorithms and Flowcharts.

UNIT II INTRODUCTION TO C PROGRAMMING 6

Features of C and its Basic Structure, Simple C programs, Constants, Integer Constants, Real Constants, Character Constants, String Constants Floating-point Numbers, The type cast Operator, Interactive Programming.

Operators Expressions and Control statement, The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The break statement and continue statement.

UNIT III ARRAYS, STRINGS AND POINTERS 6

Arrays, Multidimensional Arrays, Strings, Basics of Pointers, Pointer Arithmetic, Similarities between Pointers and One-dimensional Arrays Structures, Unions And Functions, Basics of Structures, Arrays of Structures, Pointers to Structures, Function Basics, Function Prototypes, and Passing Parameters, Structures and Functions Recursion.

UNIT IV STRUCTURAL WORKS 6

Survey – Excavation – Anti-Termite work – Reinforcement, Shuttering & Concreting: Footing, Column, Plinth beam, Back filling, Grade Slab, Column and Slab upto terrace – Block work – Plastering.

UNIT V FINISHING AND HANDING OVER WORKS 6

Wall Tile – Floor Tile – Paint – Main & Internal Doors – Window works: Grill & fixings – MEP works – False Ceiling – Deep Cleaning – Handing Over.

TOTAL : 30 PERIODS

REFERENCES:

1. Programming in ANSI C - Balagurusamy - Tata McGraw-Hill Education, 2008.
2. Programming in C (3rd Edition), by Stephen G. Kochan, Sams, 2004 .
3. Programming in C - Stephen G. Kochan, III Edition, Pearson Education.
4. Muhammed Ali Mazidi The 8051 Microcontroller and Embedded Systems, Pearson.
5. Hands – on Construction by Gerry O' Hanlon – An Overview of Civil Engineering Fieldwork., Kindle Edition
6. Things Every Civil Engineer Must Know at Site by Er. Mohammed Aasim., Kindle Edition

ONLINE RESOURCES

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://www.coursera.org/courses?query=embedded%20systems

WEB RESOURCES

1. https://www.tutorialspoint.com/embedded_systems/index.htm

COURSE OUTCOMES :

Upon completion of this course, the students should be able to:

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Evaluate the situations to analyse the computational methods in order to identify and abstract the programming task involved. (K5)
5. Understand and execute the Civil - Structural works at field. (K2)
6. Know and apply the finishing andhanding over works at field. (K3)

CO- PO & PSO MAPPING:

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

SEMESTER - III

20MGMC301 SDG NO. 4	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

At the end of the course, the student is expected to

- To know about Indian constitution
- To know about central government functionalities in India
- To know about state government functionalities in India
- To know about Constitution function
- To Know about Constitutional remedies

UNIT I INTRODUCTION **6**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **6**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT **6**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

UNIT V CONSTITUTIONAL REMEDIES 6

Enforcement of fundamental rights - Power of parliament to modify the rights the conferred by this part in their application to forces.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. M.V. Pyle (2019) , "An Introduction to The Constitution of India, 5/e", Vikas Publishing, New Delhi.
4 P.M. Bakshi, (2018) , "Constitution of India", Universal Law Publishing, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the Constitution and Fundamental rights of citizens (K2)
2. Discuss the structure, hierarchy and functions of Central Government (K2)
3. Explain the functions of Supreme Court and Judiciary Systems in the state (K2)
4. Discuss the structure, hierarchy and functions of State Government (K2)
5. Recall the Centre-State relationship, constitutional amendments and functionaries (K1)
6. Discuss the remedies and rights available to India Citizens (K2)

CO – PO MAPPING:

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

SEMESTER - IV

20BSMA403 SDG NO. 4	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To identify small, large samples and apply testing of hypothesis
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To introduce the basic concepts of solving algebraic and transcendental equations
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines
- To introduce the knowledge of various techniques and methods of solving ordinary differential equations

UNIT I TESTING OF HYPOTHESIS 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F-distributions for mean, variance and proportion - Contingency table (test for independence) - Goodness of fit.

UNIT II DESIGN OF EXPERIMENTS 12

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 12

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Single step methods : Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods : Milne's and Adams - Bashforth predictor corrector methods for solving first order equations. Solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by Crank Nicholson method – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.

WEB RESOURCES:

1. https://www.classcentral.com/course/swayam-numerical-analysis-17709
2. https://online-learning.harvard.edu/course/statistics-and-r?delta=1

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3057/numerical-methods-and-computation
2. https://nptel.ac.in/courses/111107105/
3. https://www.maths.unsw.edu.au/courses/math2089-numerical-methods-and-statistics

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply statistical techniques for testing of hypothesis of small and large samples. (K3)
2. Perform Analysis of Variance (ANOVA) in the Design of Experiments. (K3)
3. Provide numerical solution for Algebraic equations, Transcendental equations and Eigen value problems. (K3)
4. Apply Numerical techniques to interpolate data and find Numerical Differentiation and Integration. (K3)
5. Solve Ordinary and Partial Differential equations using numerical techniques. (K3)

CO- PO MAPPING:

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

SEMESTER - IV

20CEPC401 SDG NO. 4	APPLIED HYDRAULIC ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart basic knowledge about the open channel flow
- To analysis of uniform flow, gradually varied flow and rapidly varied flow.
- To expose to basic principles of working of hydraulic machineries
- To design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps

UNIT I UNIFORM FLOW **10**

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Sub-critical, Super-critical and Critical flow-Velocity distribution in open channel - Steady uniform flow : Chezy equation, Manning equation - Best hydraulic

sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II GRADUALLY VARIED FLOWS **9**

Dynamic equations of gradually varied - Water surface flow profile classifications : Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step Method – Change in Grades.

UNIT III RAPIDLY VARIED FLOWS **8**

Application of the momentum equation for RVF – Hydraulic Jumps - Types – Energy dissipation – Positive and Negative surges.

UNIT IV TURBINES **9**

Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbine - Francis turbine -Kaplan turbine-Draft tube – Cavitation - Performance of turbine-Specific speed – Run away speed.

UNIT V PUMPS **9**

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitation in pumps – Operating characteristics - Multistage pumps – Reciprocating pumps - Negative slip - Indicator diagrams and its variations- Air vessels- Savings in work done.

TOTAL:45PERIODS

TEXT BOOKS:

1. Jain. A.K., “Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
2. Chandramouli P.N., “Applied Hydraulic Engineering”, Yes Dee Publishing Pvt. Ltd.,2017

REFERENCES:

1. VenTe Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.
2. .Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
3. Mays L.W., Water Resources Engineering, John Wiley and Sons (WSE), NewYork, 2005.
4. Subramanya K, Flow in open channels, Tata Mc Graw Hill, New Delhi, 2000

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_ce30/preview

2. https://nptel.ac.in/courses/105107059/
3. https://learnmechanical.com/fluid-mechanics-and-hydraulic-machine/

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3083/advanced-hydraulics
2. https://www.coursera.org/lecture/fe-exam/pumps-and-turbines-b84hN

OUTCOMES:

Upon completion of the course, the student should be able to:

1. 1. Illustrate types of flow, properties of open channels, velocity distribution by applying the knowledge of fluid mechanics and by using fundamental equations of open channels. (K2)
2. Apply Chezy's equation and Manning equation to find out best hydraulic section for uniform flow, computation of specific energy and specific force in uniform flow. (K2)
3. Understand gradually varied flow, classification of water surface flow profile, profile determination by direct and standard step methods and change in grades by applying dynamic equation. (K2)
4. Solve the problems relevant to hydraulic jump, surges and celerity in varied flow by using momentum equation for rapidly varied flow. (K2)
5. Explain the working principles and applications of Pelton wheel, Francis and Kaplan turbines and to calculate the performance and specific speed of turbines. (K2)
6. Evaluate the working principles, performance characteristics and applications of centrifugal pumps, reciprocating pumps and multi-staging pumps. (K2)

CO - PO, PSO MAPPING

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

SEMESTER - IV

20CEPC402 SDG NO. 4,9,11	STRENGTH OF MATERIALS II	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material

UNIT I ENERGY PRINCIPLES **9**

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram.

UNIT II INDETERMINATE BEAMS **9**

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams,

UNIT III COLUMNS AND CYLINDERS **9**

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS **9**

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems.

UNIT V ADVANCED TOPICS **9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – stresses in hooks.

TOTAL:45 PERIODS

TEXTBOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2015
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2007.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016.
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012.

WEB REFERENCES:

1. https://uomustansiriyah.edu.iq/media/lectures/5/5
2. https://www.classcentral.com/course/swayam-strength-of-materials-14308
3. https://nptel.ac.in/courses/112/107/112107146/

ONLINE RESOURCES:

1. https://freevideolectures.com/course/96/strength-of-materials
2. http://www.nptelvideos.in/2012/11/strength-of-materials-prof.html

OUTCOMES:

Upon completion of the course, the students will be able to

1. Determine the strain energy due to axial load, shear, flexure and torsion and understand the concept of energy theorems such as Castigliano's theorems ,Maxwell's reciprocal theorem and Principle of virtual work. (K2)

2. Apply energy theorems for computing slope and deflections in determinate beams , plane frames and plane trusses. (K3)
3. Analyze the indeterminate structures like propped cantilever, fixed beams and continuous beams for external loadings and support settlements.(K3)
4. Calculate the load carrying capacity for prismatic and Eccentrically loaded columns with different end conditions by Euler's column theory and Rankine's -Gordon formula and stresses in Thin cylinders , Thick cylinders and spherical shells. (K2)
5. Determine the principal stresses and principal planes for an element in three dimensional state of stress and apply various theories of failure to analyse the materials in complex stress condition. (K3)
6. Compute the stresses due to Unsymmetrical bending of beams of symmetrical and unsymmetrical sections, locate the shear center, and find the stresses in curved beams. (K3)

CO - PO, PSO MAPPING

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

SEMESTER - IV

20CEPC403 SDG NO. 4,9,11&15	SOIL MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification
- To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils
- To impart knowledge of design of both finite and infinite slopes

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Formation of soil-Soil description–Particle–Size shape and colour–Composition of gravel, sand, silt, clay particles–Particle behaviour–Soil structure–Phase relationship–Index properties–Significance–BIS classification system–Unified classification system–Compaction of soils–Theory, Laboratory and field tests–Field Compaction methods–Factors influencing compaction of soils.

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9

Soil -water–Static pressure inwater-Effective stress concepts in soils–Capillary phenomena– Permeability interaction –Hydraulicv conductivity –Darcy'slaw –Determination of Hydraulic Conductivity–Laboratory Determination(Constant head and falling head methods)and field measurement pumping out in unconfined and confined aquifer– Factors influencing permeability of soils–Seepage- Two dimensional flow –Laplace's equation–Introduction to flow nets–Simple problems. (Sheetpile and wier).

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium–Boussinesq theory –(Point land, Line land and udl) Use of New marks influence chart–Components of settlement–– Immediate and consolidation settlement–Terzaghi'sone dimensional consolidation theory–Computation of rate of settlement.-$\sqrt{t}$ and logt methods–e-logp relationship.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesionless soils–Mohr-Coulomb failure theory–Measurement of shear strength-Direct shear, Triaxial compression, UCC and Vane shear tests–Pore pressure parameters–Cyclic mobility–Liquefaction.

UNIT V SLOPE STABILITY 9

Stability Analysis-Infinite slopes and finite slopes–Total stress analysis for saturated clay– Friction circle method–Use of stability number–Method of slices–Fellenious and Bishop's method- Slope protection measures.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Murthy,V.N.S., “Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., NewDelhi, 2015.
2. Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, “Basic and Applied Soil Mechanics” New Age International Publication, 3rd Edition, 2016.

REFERENCES:

1. Mc Carthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.
2. Coduto,D.P., "Geotechnical Engineering–Principles and Practices", Prentice Hall of India Pvt.Ltd. NewDelhi, 2010.
3. Das,B.M., "Principles of Geotechnical Engineering", Brooks/Coles/ Thompson Learning Singapore, 8thEdition, 2013.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., NewDelhi, 2005.

WEB REFERENCES:

1. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/
2. https://www.aboutcivil.org/factors-affecting-soil-compaction
3. https://lecturenotes.in/subject/603/soil-mechanics-sm
4. https://nptel.ac.in/courses/105/103/105103097/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105101084/
2. https://www.aboutcivil.org/factors-affecting-soil-compaction
3. https://www.youtube.com/watch?v=DSsh9UebGqA
4. https://www.youtube.com/watch?v=7Fx9TnMn1HE&list= PLSNhedsleX12Ww7Ew6MCi-gGf4guftZdd
5. https://nptel.ac.in/courses/105/103/105103177/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the concepts of soil formation like soil structure, index properties, engineering properties, Unified soil classification system and testing methods of soil compaction (K1)
2. Determine the soil behavious like effective and total pressure , permeability, capillarity of confined and unconfined aquifer and compute seepage for 2D flow by using Laplace equation (K2)
3. Analyse the stress distribution in homogenous and isotropic medium using Boussinesq theory and compute the rate of settlement by Terzgahi 's one dimensional consolidation theory (K3)
4. Apply Mohr - Coulomb failure theory to calculate the shear parameters of cohesive and cohesionless soils (K2)
5. Explain the procedures to conduct shear tests and solve problems in finding pore pressure parameters (K1)

6. Analyze various slope failures by Friction circle method, method of slices, Fellenious and Bishop's method and slope protection measures (K2)

CO- PO, PSO MAPPING :

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

SEMESTER - IV

20CEPC404 SDG NO. 4,9,11	HIGHWAY ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To give an overview on the basics of highway engineering and to impart the various process and methods involved in the planning, development, design, construction and maintenance of highways

UNIT I HIGHWAY PLANNING AND ALIGNMENT 8

History of road development in India – Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment – Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 10

Typical cross sections of Urban and Rural roads – Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients, hairpin bends – Lateral and vertical clearance at underpasses – IRC standards - Road signs and safety - Urban utility services.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Design principles – pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT IV HIGHWAY CONSTRUCTION AND MAINTENANCE 10

Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavements including modern materials and methods, Highway drainage – Special considerations for hilly roads; Evaluation and Maintenance of pavements.

UNIT V HIGHWAY ECONOMICS AND FINANCE 8

Introduction, Highway User Benefits, Highway Costs, Vehicle Operation Costs, Economic analysis, Highway projects under Public-Private Sector Participation, Bidding process, Highway finance.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Veeraragavan. A, Khanna.K and Justo.C.E.G. "Highway Engineering", Nem Chand & Bros Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.
3. C.Venkatramaiah., "Transportation Engineering-Highway Engineering", Universities Press (India) Private Limited, Hyderabad, 2015.
4. Subhash C Saxena, "Textbook of Highway and Traffic Engineering", CBS Publishers, 2017.
5. R.Srinivasa Kumar., "Textbook of Highway Engineering", Universities Press (India) Private Limited, Hyderabad, 2011.

REFERENCES:

1. Partha Chakroborty and Animesh Das, "Principles of Transportation Engineering", PHI Learning Pvt. Ltd., 2005.
2. Kadiyali. L. R., "Principles and Practice of Highway Engineering", Khanna Technical Publications, Delhi, 1997.
3. Indian Road Congress (IRC), Guidelines and Special Publications on Planning and Design of Highways.
4. Sharma.S.K., "Principles, Practices and Design of Highway Engineering", S.Chand and Company Ltd.1995.

WEB REFERENCES:

1. https://nhai.gov.in/indian-road-network.htm
2. https://nptel.ac.in/courses/105/101/105101087/
3. http://www.freeengineeringbooks.com/Civil/Transportation-Engineering-Books.php

4. https://www.ite.org/
5. https://www.fhwa.dot.gov/resources/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105107/
2. http://egyankosh.ac.in//handle/123456789/36994

OUTCOMES:

Upon completion of the course, the student should be able to

1. Acquire knowledge on development, classification, planning, alignment and engineering surveys of highways & related infrastructures. (K2)
2. Understand the concept of cross sectional elements & sight distances and design horizontal alignment of highways. (K3)
3. Apply the knowledge of basic geometrical elements to design vertical alignment & underpasses and understand the concept of road signs and safety, utility services as per IRC standards.(K3)
4. Design various types of pavements to meet specified needs of safety, efficiency and long time sustainability by adopting various design standards. (K3)
5. Derive knowledge on properties , testing methods of conventional and modern Highway construction materials, evaluation and maintenance of pavements.(K2)
6. Understand the bidding processes, economic analysis and financial aspects of the highway projects under public & private Sector. (K2)

CO- PO, PSO MAPPING:

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

SEMESTER - IV

20BSCY201 SDG NO. 4,17	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts about environment
- To find and implement scientific, technological, economic and political solutions to environmental problems
- To study the interrelationship between living organism and environment
- To provide the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness – Ecosystem: concept of an ecosystem – structure and functions of an ecosystem – Biotic and abiotic components – Biogeochemical cycle (C, N & P) – energy flow in the ecosystem – food chains, food webs and ecological pyramids – ecological succession - keystone species. Introduction to biodiversity definition: genetic, species and ecosystem diversity – values of biodiversity – IUCN Red list species classification - endemic, endangered, rare, vulnerable, extinct and exotic species – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of Terrestrial (Forest, Grassland, Desert) and Aquatic ecosystem (Pond, Lake, River, Estuary and Marine)

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: Air pollution, Water pollution, Soil pollution Marine pollution, Noise pollution, Thermal pollution and Nuclear pollution – solid waste management: causes, effects and control measures of municipal solid wastes (MSW) – role of an individual in prevention of pollution – Case studies related to environmental pollution.

Disaster management: floods, earthquake, cyclone and landslides – nuclear holocaust – Case studies.

UNIT III NATURAL RESOURCES 9

Forest resources: Use and over – exploitation, deforestation – Land resources: land degradation, man induced landslides, soil erosion and desertification – Water resources: Use and over- utilization of surface and groundwater – dams-benefits and problems, conflicts over water – Mineral resources: Environmental effects of extracting and using mineral resources – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – fertilizer – pesticide problems, water logging and salinity. Energy resources: Renewable energy (Solar energy, Wind energy, Tidal energy, Geothermal energy, OTE, Biomass energy) and non renewable energy (Coal, Petroleum, Nuclear energy) sources. – role of an individual in conservation of natural resources. Case studies – timber extraction, mining, dams and their effects on forests and tribal people.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 10

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect- role of greenhouse gases on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures). environmental ethics: Issues and possible solutions – Green chemistry - 12 principles of green chemistry.

Urbanisation - Urban problems related to energy - Water conservation: rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns - case studies. Environment Legislations and Laws : Environment (protection) act – 1986. Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. Biomedical Waste(Management and Handling rules):1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark) - Issues involved in enforcement of environmental legislation - central and state pollution control boards, role of non-governmental organization – Public awareness - Environmental Impact Assessment (EIA).

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 8

Population growth, variation among nations – population explosion – family welfare programme – women and child welfare environment and human health – HIV / AIDS – Role of Information Technology in environment and Human health – Case studies – human rights – value education – Sustainable Development – Need for sustainable development – concept – 17 SDG goals – 8 Millennium Development Goals(MDG).

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.

REFERENCES :

1. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd., Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd., Delhi, 2014.
4. Rajagopalan. R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

OUTCOMES:

Upon successful completion of this course, student should be able to

1. Explain the different components of environment , structure and function of an ecosystem, importance of biodiversity and its conservation. (K2)
2. Identify the problems of environmental pollution, its impact on human and ecosystem, control measures and basic concepts in Disaster Management. (K2)
3. Disseminate the need for the natural resources and its application to meet the modern requirements and the necessity of its conservation. (K2)
4. Illustrate the basic principles on various aspects of atmospheric chemistry with a focus on climate change and describe suitable scientific, technological solutions to eradicate environmental issues and recognize the principles of green chemistry. (K2)
5. Demonstrate an integrative approach to social issues and Protection Acts for attaining an eco friendly environment. (K2)
6. Recognize the need for population control measures and the environmental based value education concepts to achieve the Sustainable Development Goals. (K2)

CO - PO MAPPING :

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

SEMESTER - IV

20CEPL401 SDG NO. 4,9	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To impart knowledge and skill relevant to the mechanical properties of materials subjected to different types of loading on wood and steel

LIST OF EXPERIMENTS (Restrict Max 10-12 Nos only)

1. Compression test on wood
2. Double shear test on metal
3. Torsion test on mild steel rod
4. Impact test on metal specimen (Izod and Charpy)
5. Hardness test on metals (Rockwell and Brinell Hardness Tests)
6. Deflection test on metal beam
7. Compression test on helical spring
8. Deflection test on carriage spring
9. Tension test on mild steel rod

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

S.No.	EQUIPMENTS	QUANTITY
1.	UTM of minimum 400 kN capacity	1
2.	Torsion testing machine	1
3.	Izod impact testing machine	1

4.	Hardness testing machine Rockwell Vicker's (any 2) Brinnel	Each 1
5.	Beam deflection test apparatus	1
6.	Extensometer	1
7.	Compressometer	1
8.	Dial gauges	Few

OUTCOMES

On completion of this laboratory course, the student should be able to

1. Apply the knowledge of testing steel rod subjected to tension and torsion and the hardness of different metals. (K3)
2. Exert the knowledge about the testing of helical spring and carriage spring. (K3)
3. Acquire the knowledge about double shear test on metal and impact test on metal. (K4)
4. Obtain the practical knowledge about the deflection of the beam. (K3)

CO- PO, PSO MAPPING:

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

SEMESTER - IV

20CEPL402 SDG NO. 4	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To provide hands on experience in calibration of Flow meters
- Understand the performance characteristics of pumps and turbines

LIST OF EXPERIMENTS

1. Calibration of Rotameter
2. Calibration of Orifice / Venturimeter
3. Bernoulli's Experiment
4. Determination of friction factor in pipes.
5. Determination of minor losses
6. Characteristics of Centrifugal pumps
7. Characteristics of Gear pump
8. Characteristics of Submersible pump
9. Characteristics of Reciprocating pump
10. Characteristics of Pelton wheel turbine
11. Characteristics of Francis turbine
12. Determination of metacentric height of floating bodies.

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

Sl.No.	EQUIPMENTS
1.	Bernoulli's theorem – Verification Apparatus
2.	Calculation of Met centric height water tank Ship model with accessories
3.	(i) Venturimeter, Utube manometer fixtures like Valves, collecting Tank (ii) Orifice meter, with all necessary fittings in pipelines of different Diameters.
4.	Pipe lengths (min. 3m) of different diameters with Valves and pressure rapping & collecting tank
5.	Pipe line assembly with provisions for having Sudden contractions in diameter, expansions Bends, elbow fitting, etc.
6.	Centrifugal pump assembly with accessories (single stage).

7. Centrifugal pump assembly with accessories (multistage).
8. Reciprocating pump assembly with accessories.
9. Deep well pump assembly set with accessories.
10. Impulse turbine assembly with fittings &accessories.
11. Francis turbine assembly with fittings &accessories.
12. Kaplan turbine assembly with fittings &accessories.

OUTCOMES

On completion of this laboratory course, the student should be able to

1. Apply Bernoulli equation for calibration of flow measuring devices (K3)
2. Measure friction factor in pipes and compare with Moody diagram(K4)
3. Determine the performance characteristics of rotodynamic pumps (K3)
4. Determine the performance characteristics of positive displacement pumps and Turbines. (K4)

CO- PO, PSO MAPPING

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

SEMESTER - IV

20CETE401 SDG NO. 4,11,15	LIVE-IN-LAB - II	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To enable hands-on experience in the electronics hardware/Software domain
- To enable development of skill set for designing and realizing prototype electronic systems/simulation model

COURSE METHODOLOGY

- This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students

- The project work must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development
- Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project
- On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION

- First evaluation (Immediately after first internal examination) : 20 marks
- Second evaluation (Immediately after second internal examination): 30marks
- Final evaluation Last week of the semester) : 50marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

1. Conduct literature survey to identify the gap and an application oriented research problem in the specific domain(K4)
2. Design and validate the proposed system using simulation(K6)
3. Prototype the proposed system(K5)
4. Analyze the obtained results and prepare a technical report(K4)
5. Publish the work in journals and apply for the patents.(K3)
6. Prepare for industrial environment and real time work(K3)

CO- PO & PSO MAPPING :

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

SEMESTER - IV

20CETP401 SDG NO. 4	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

PROBLEM SOLVING SKILLS – PHASE 1

COURSE OBJECTIVE:

- Improve their quantitative ability.
- Improve their reasoning ability.
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – III **6**

Compound Interest, Profit and Loss, Partnership, Percentage, Set Theory

UNIT II QUANTITATIVE ABILITY – IV **6**

True Discount, Ratio and Proportion, Simplification, Problems On H.C.F and L.C.M

UNIT III REASONING ABILITY – II **6**

Course of Action, Cause and Effect, Statement and Conclusion, Statement and Argument, Data Sufficiency (DS), Statement and Assumption, Making Assumptions.

UNIT IV VERBAL ABILITY – II **6**

Change of Voice, Change of Speech, Letter and Symbol Series, Essential Part, Verbal Reasoning, Analyzing Arguments.

UNIT V CREATIVITY ABILITY – II **6**

Seating Arrangement, Direction Sense Test, Character Puzzles, Missing Letters Puzzles, Mirror &Water Images.

TOTAL : 30 PERIODS

REFERENCES:

1) Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2) Quantum CAT by Sarvesh Verma
3) A Modern Approach to Logical Reasoning by R. S. Agarwal
4) Verbal Ability and Reading Comprehension by Arun sharma

FUNDAMENTALS OPERATIONS OF SOFTWARE TOOLS IN CIVIL ENGINEERING - PHASE 2

COURSE OBJECTIVE:

- To improve C programming skills with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To understand procedural programming methods using MATLAB & SIMULINK.
- Create documents using word processor, spreadsheet & presentation software
- To make the students familiar with common elements of various building bye-laws, and the National Building Code 2005

UNIT I INTRODUCTION TO RECURSION AND GROWTH FUNCTIONS **6**

Introduction to Recursion, Recurrence Relation, Deriving time complexity and space complexity using recurrence relation Polynomial Equations, Compare growth functions, Nth Fibonacci Number, Exponent Function, Taylor Series, Tower of Hanoi.

UNIT II STORAGE CLASSES, THE PREPROCESSOR AND DYNAMIC MEMORY ALLOCATION **6**

Storage Classes and Visibility, Automatic or local variables, Global variables, Macro Definition and Substitution, Conditional Compilation, Dynamic Memory Allocation, Allocating Memory with malloc and callo Allocating Memory with calloc, Freeing Memory, The Concept of linked list, Inserting a

node by using Recursive Programs, Deleting the Specified Node in a Singly Linked List.

UNIT III FILE MANAGEMENT AND BIT MANIPULATION 6

Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Random Access to Files, Command Line Arguments, The hexadecimal number system, C bitwise operators, , How to generate all the possible subsets of a set, Tricks with Bits, Applications of bit operations.

UNIT IV SOFTWARE APPLICATION IN PROJECT REPORT PREPARATION6

Creation of Project Presentation - Preparation of Slides - Selection of type of Slides - Providing aesthetics - Slide Designs - Slide Manipulation and Slide Show - Presentation of the Slides. Spreadsheets and Basic Data Analysis - Elements of Spread Sheet - Application/usage of Spread Sheet - Manipulation of cells - Formulas and functions - Spread sheets for project budget report & MIS reports - basic practical data analysis works – preparation of daily and monthly progress reports.

UNIT V BASICS OF BUILDING DRAWING & BUILDING BYE LAW 6

Classification of buildings - Dimensions of buildings - Building bye-laws for floor area ratio and open spaces - Orientation of buildings - Lighting and Ventilation - Types of Projection adopted in Building Drawing - Introduction of perspective view and other related terms in building drawings

TOTAL : 30 PERIODS

REFERENCES:

1. R. G. Dromey, "How to Solve It By Computer", Pearson, 1982
2. A.R. Bradley, "Programming for Engineers", Springer, 2011
3. Kernighan and Ritchie, "The C Programming Language", (2nd ed.) Prentice Hall, 1988
4. Allan M Jones. “The use and abuse of PowerPoint in Teaching and Learning in the Life Sciences: A Personal Overview”. In: Bioscience Education 2.1 (2003), pp. 1–13. DOI: 10.3108/beej.2003.02000004
5. Joseph De Chiara, Michael J Crosbie, 'Time Saver Standards for Building Types', McGraw Hill Professional, 2001.
6. National Building Code and Bureau of Indian standard publication

ONLINE RESOURCES

1. https://matlabacademy.mathworks.com/
2. https://www.tutorialspoint.com/matlab/index.htm

3. https://medium.com/quick-code/top-tutorials-to-learn-matlab-for-beginners-d19549ecb7b7
4. https://nptel.ac.in/courses/103/106/103106118/

WEB RESOURCES

1. https://www.mathworks.com/academia/books.html
2. https://in.mathworks.com/support/learn-with-matlab-tutorials.html

COURSE OUTCOMES :

Upon completion of this course, the students should be able to:

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Understand to improve C programming skills to apply advance structured and procedural programming. (K2)
5. Manipulating slides to enhance the look of the slides as well as whole presentation by inserting a picture, objects, multimedia formatting etc. (K3)
6. Acquaint with knowledge on the basic functional aspect of designing complex building types, its relevant site planning and spatial organization. (K2)

CO- PO & PSO MAPPING:

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

SEMESTER - V

20CEPC501 SDG NO. 4,9,11&15	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge to plan and execute a details it investigation programme
- To select geotechnical design parameters and type of foundations
- Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and objectives – Methods of exploration – Auguring and boring– Wash Boring and Rotary Drilling – Depth and spacing of boreholes – Soil Samples – Representative and undisturbed –Sampling methods – Split Spoon Sampler, Thin Wall Sampler - Stationary Piston sampler –Penetration tests (SPT and SCPT) – Data interpretation - Strength parameters and Evaluation of Liquefaction potential-Selection of foundation based on soil condition-Borelog report.

UNIT II SHALLOW FOUNDATION 9

Introduction–Location and depth of foundation–Codal provisions–Bearing capacity of shallow foundation on homogeneous deposits –Terzaghi'sformula and BIS formula–Factors affecting bearing capacity–Bearing capacity from in-situ tests (SPT,SCPT and plate load) –Allowable bearing pressure–Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits– Total and differential settlement–Allowable settlements–Codal provision –Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing, Mat foundation–Contact pressure and settlement distribution–Proportioning of foundations for conventional rigid behaviour–Minimum depth for rigid behaviour–Applications–Floating foundation–Special foundations–Seismic force consideration–Codal provision

UNIT IV PILE FOUNDATION 9

Types of pile sand their functions–Factors influencing the selection of pile–Carrying capacity of single pile in granular and cohesive soil –Static

formula–Dynamic formulae (Engineering news and Hileys)–Capacity from insitu tests (SPT, SCPT)–Negative skin friction – Uplift Capacity - Group Capacity by Different Methods (Feld's rule, Converse – Labarra formula and Block Failure Criterion) – Settlement of Pile Groups – Interpretation of Pile Load Test (Routine Test only), Under Reamed Piles – Capacity under Compression and uplift–Codal provision.

UNIT V RETAINING WALLS **9**

Plastic Equilibrium in Soils–Active and Passive States–Rankine's Theory – Cohesionless and cohesive soil–Coulomb's wedge theory–Condition for critical failure plane–Earth pressure on retaining walls of simple configurations–Culmann Graphical method–Pressure on the wall due to line load –Stability analysis of retaining walls–Codal provision.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. V.N.S.Murthy , "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd. NewDelhi,2015.
2. B.C.Punmia, "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., NewDelhi, 2005.

REFERENCES:

1. Das,B.M. "Principles of Foundation Engineering" (Eigth edition), Thompson Asia Pvt.Ltd.,Singapore, 2013.
2. Kaniraj,S.R., "Design aids in Soil Mechanics and Foundation Engineering", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2002.
3. Varghese, P.C., "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi,2005.
4. Gopal Ranjanand Rao A.S.R. "Basic and Applied soil Mechanics", New Age International (P) Ltd, NewDelhi,2006.
5. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).

ONLINE RESOURCES:

1. http://www.cdeep.iitb.ac.in/webpage_data/nptel/Civil%20 Engineering/foundation_Engineering/TOC- M1.htm
2. https://nptel.ac.in/courses/105105176/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the Methods of exploration of soil samples by penetration test and selection of foundation based on soil condition (k2)

2. Describe and solve bearing capacity of shallow foundation by allowable bearing pressure in seismic conditions using Terzaghi's formula and BIS formula (k3)
3. Describe Settlement of foundations on granular and clay deposits by Total and differential settlements (k2)
4. Illustrate differnt Types of footings and its proportionating applications for seismic forces through codal provisions (k3)
5. Interpret the load carrying capacity of different type of piles using different pile load test (k2)
6. Apply the principle of plastic equilibrium in cohesionless and cohesive soilfor the Stability analysis of retaining walls (k3)

CO- PO, PSO MAPPING :

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

SEMESTER - V

20CEPC502 SDG NO. 4 & 9	PUBLIC HEALTH & SANITATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To design the water supply and waste water treatment systems
- To determine the treatment efficiency of treatment units

UNIT I WATER TREATMENT PLANT, COLLECTION AND CONVEYANCE OF RAW WATER & DISTRIBUTION SYSTEM 9

Water Quantity Estimation : Population forecast; Water demand for various purposes; Sources of water and their characteristics - Drinking Water quality standards Collection & conveyance of water : Intake structures; Pipe materials,

Hydraulics of flow in pipes – Laying, jointing and testing of pipes – pipe appurtenances, design of pumps; Types and capacity of pumps – Selection of pumps Distribution system: Layouts of distribution networks,Components of distribution system, Newton's and Hardy cross methods for network analysis.

UNIT II WATER TREATMENT PROCESSES AND TREATMENT 11

Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation–Clarifloccuator- Sand filters – Disinfection.Principles and functions of Aeration - Iron and manganese removal,Defluoridation and demineralization -Water softening - Desalination - Recent Advances – Construction, Operation and Maintenance aspects.

UNIT III CHARACTERISTICS & COLLECTION OF WASTEWATER 8

Characteristics and composition of sewage -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage- Storm runoff estimation – sewer appurtenances – corrosion in sewers – prevention and control – sewage pumping-drainage in buildings-plumbing systems for drainage.

UNIT IV UNIT OPERATIONS/ PROCESSES FOR WASTEWATER TREATMENT 11

Unit Operations and Processes – Selection of treatment processes - Onsite sanitation - Septic tank Physical Unit Processes: Principles, functions and design of - screens - grit chamber-primary sedimentation tanks. Biological Unit Processes: Principles, Functions of - Activated Sludge Process -Trickling filters– Sequencing Batch Reactor – Membrane Bioreactor - UASB – Waste Stabilization Ponds Other treatment methods - Construction, Operation and Maintenance aspects.

UNIT V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 6

Standards for Disposal - Methods – dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.K.Garg, “Environmental Engineering” volume 1 and 2, Khanna publisher.
2. B.C.Punmia, “Environmental Engineering" volume 1 and 2, Laxmi Publication.

REFERENCES:

1. Dr.P.M.Modi, "Environmental Engineering" Volume 1 and 2.
2. G.S.Birdie and J.S.Birdie, "Water Supply and Sanitary Engineering".
3. B.S.N Raju, "Water Supply and Wastewater Engineering", Tata McGraw Hill, New Delhi.
4. H.S. Peavy, D.R.Row & G.Tchobanoglous, "Environmental Engineering,Mc Graw Hill Intranational Edition.
5. M.L.Devis and D.A.Cornwell, "Introduction to Environmental Engineering", 2nd edition-1997,Mc Graw Hill Intranational Edition.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105104102/
2. http://nptel.iitm.ac.in

OUTCOMES:

Upon completion of the course, the student should be able to

1. Estimate the Water Quantity with Population forecast & Water demand for various purposes by identifying the Sources of water and their characteristics with Drinking Water quality standards. (K3)
2. Describe the Intake structures , Pumps for Collection & conveyance of water, and Layouts of distribution networks, Components of distribution system, Newton's and Hardy cross methods for network analysis. (K3)
3. Explain the Principles, functions, design , Construction, Operation and Maintenance aspects of water treatment plant units for Unit operations and processes. (K2)
4. Elucidate the sources of sewage generation , characteristics of sewage and estimate sewage, Storm drainage and Storm runoff for Sewer design. (K2)
5. Illustrate the Principles, functions and design of various Physical and Biological Unit Processes and Operation for waste water. (K3)
6. Identify the suitable mode of disposal for sewage and sludge without endangering the environment and its standards with recent advances. (K2)

CO- PO, PSO MAPPING

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

SEMESTER - V

20CEPC503 SDG NO. 4	DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on basic of concepts of design of reinforced concrete structures and to make the students able to design and detail the basic elements like beam, slab, column, footing and staircase and few structures like retaining wall, water tank and framed building using reinforced concrete

UNIT I DESIGN CONCEPTS AND DESIGN OF BEAMS FOR FLEXURE 9

Design concepts – Concept of elastic method, ultimate load method and limit state method– Advantages of Limit state method over other methods – Design of rectangular beam section by working stress method– Limit state method of design of singly reinforced, doubly reinforced and flanged beams-use of design aids for flexure.

UNIT II LIMIT STATE DESIGNOF BEAMS FOR SHEAR, TORSION AND SERVICEABILITY 9

Limit state design of RC beams for shear and torsion – Design of RC beams for combined bending, shear and torsion – Use of design aids – Design requirement for bond and anchorage as per IS code –Detailing of reinforcement – Concept of Serviceability -Serviceability requirements for deflection.

UNIT III LIMIT STATE DESIGN OF SLABS 9

Behavior of one way and two way slabs-Design of one way simply supported,

cantilever and Continuous slabs – Design of two-way slabs for various edge conditions – Torsion reinforcement at corners.

UNIT IV LIMIT STATE DESIGN OF COLUMNS 9

Types of columns – Design of short columns for axial load, combined axial load with uni-axial and biaxial bending – use of design aids.

UNIT V LIMIT STATE DESIGN OF FOOTING 9

Design of footing for masonry and reinforced walls – Design of axially and eccentrically loaded square and rectangular footings – Design of combined rectangular footings for two columns.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. N.Krishnaraju., " design of Reinforced concrete Structures", CBS publishers & Distributors Pvt. Ltd., New Delhi.
2. Unnikrishna Pillai and Devdas Menon, "Reinforced Concrete Design" Tata McGraw Hill Publishing Company Ltd., NewDelhi, 3rd Edition,2017.

REFERENCES :

1. N.Subramanian, "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2014.
2. P.C.Varghese, "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, Second Edition, 2008.
3. B.C. Punmia. Ashok K. Jain and Arun K. Jain, "Limit State design of Reinforced Concrete", Laxmi Publications(P)Ltd., NewDelhi, 2016.
4. S.N. Sinha, "Reinforced Concrete Design", Tata Mc Graw-Hill, New Delhi, 2002.
5. Jain, A.K., "limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998.

ONLINE RESOURCES:

1. https://swayam.gov.in/nd1_noc19_ce22/preview
2. https://nptel.ac.in/courses/105/105/105105105/
3. https://onlinecourses.nptel.ac.in/noc21_ce42/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Solve Singly, Doubly reinforced beams by working stress and limit state methods (K3)

2. Solve Flanged beams by working stress and limit state methods (K3)
3. Analyze RC beams for combined bending shear and torsion to satisfy serviceability requirements (K2)
4. Analyze one way and two way slabs for various edge conditions (K3)
5. Analyze columns and footings for axial load, combined axial load with uni-axial and biaxial bending (K3)
6. Solve axially and eccentrically loaded square and rectangular footings (K3)

CO - PO, PSO MAPPING

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

SEMESTER - V

20CEPC504 SDG NO. 2,7,9, 11&13	STRUCTURAL ANALYSIS - I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the students to basic theory and concepts of classical methods of structural analysis

UNIT I STRAIN ENERGY METHOD **9**

Determination of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method (up to two degree of redundancy)

UNIT II SLOPE DEFLECTION METHOD **9**

Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements- symmetric frames with symmetric and skew-symmetric loadings

UNIT III MOMENT DISTRIBUTION METHOD **9**

Stiffness and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - symmetric frames with symmetric and skew-symmetric loadings.

UNIT IV FLEXIBLITY METHOD **9**

Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

UNIT V STIFFNESS METHOD **9**

Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

TOTAL:45 PERIODS

TEXT BOOKS:

1. S.S.Bhavikatti, "Structural Analysis", Vol.1,& 2, Vikas Publishing House Pvt.Ltd., NewDelhi, 2014.
2. Vazrani. V.N and Ratwani, M.M, "Analysis of Structures", Vol.II, Khanna Publishers, 2015.

REFERENCES:

1. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 2004.
2. William Weaver, Jrand James M.Gere, "Matrix Analysis of Framed Structures", CBS Publishers & Distributors, Delhi,1995.
3. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012
4. Reddy.C.S, "Basic Structural Analysis",Tata McGraw Hill Publishing Company,2005
5. Rajasekaran. S, & G. Sankarasubramanian., "Computational Structural Mechanics", PHI Learning Pvt. Ltd, 2015.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Analyse continuous beams, plane frames and indeterminate plane trusses by strain energy method (K3)
2. Apply Slope Deflection Method to solve continuous beams and rigid frames (K3)
3. Analyse continuous Beams- Plane rigid frames with and without sway by Moment Distribution Method (K3)
4. Analyse beams and frames with support Settlement (K3)
5. Apply direct flexibility approach to analyse indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames (K3)
6. Apply direct stiffness method of analysis to Continuous Beams, Pin-jointed plane frames and rigid frames (K3)

CO - PO, PSO MAPPING:

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

SEMESTER - V

20CEPC505 SDG NO. 4 & 9	SUSTAINABLE URBAN INFRASTRUCTURE DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the environmental impact on buildings and its assessment by applying sustainable building techniques
- Understand sustainable building planning policies, implementation, and innovative building materials for low cost housing
- Vernacular architecture, green building concept, resource management and assessment of building performance

UNIT I SUSTAINABLE DEVELOPMENT AND PLANNING **9**

Concept, perspectives, need and importance, Environmental impact of building sector, current situation of environmental policies for building sector, concept and elements of sustainable planning for building industry, past perspectives on planning, situating sustainable planning within planning theory, Planners roles.

UNIT II SUSTAINABLE BUILDING PLANNING **9**

Policies and exploring implementation gaps, urban design, Environment protection, site planning, energy conservation through planning and modeling, water use reduction, passive solar design, building technologies, indoor air quality, barriers to implementation of sustainable building measures, checklist for sustainability, policy recommendations for sustainable buildings. Innovative building material for rural and urban areas, Low Cost Infrastructure in rural Areas and Cost Cutting of housing Infrastructure.

UNIT III URBAN HOUSING AND INFRASTRUCTURE 9

Vernacular Architecture, Urban climate and effect of built environment, Impact of urbanization on sustainability, growth and issues related to sustainability.

UNIT IV GREEN BUILDINGS 9

Concept and need, design principles, growth at International and national level, benefits, construction techniques, green materials, planning and case studies of residential. Commercial and industrial buildings. Green building Evaluation Systems; LEED Certification; Green Globe Certification.

UNIT V BUILDING PERFORMANCE ASSESSMENT 9

Concept, tools at international and national level, process of green building certification, comparison of different tools like LEED INDIA, GRIHA,SBTool etc. Recent research on sustainable building development and assessment tools.

TOTAL: 45 PERIODS

REFERENCES:

1. Stephen M. Wheeler, Routledge, "Planning for sustainability: Creating Livable, Equitable and Ecological Communities" ,Taylor and Francis group, New York. 2004.
2. Nicola Maiellaro, "Towards Sustainable Building", Kluwer Academic Publishers, Netherlands, 2001.
3. "Sustainable Building Design Manual: Sustainable Building Design practices", The Energy and Resources Institute, New Delhi. 2001.
4. Takahiko Hasegawa, "Environmentally sustainable buildings: challenges and policies", Organization for economic co- operation and development (OECD) publications, France, 2003.
5. Thomas E Glavinich, "Green Building Construction", Wiley, 2008.

WEB REFERENCES:

1. https://www.planradar.com/sustainable-building-design-construction-framework/
2. https://theconstructor.org/building/sustainable-building-planning-and-design/176/
3. https://www.wbdg.org/resources/green-building-standards-and-certification-systems

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/102/105102195/
2. https://nptel.ac.in/courses/124/107/124107011/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe Environmental impact of building sector satisfying sustainable planning with environmental policies (k2)
2. Classify different types building technologies in environmental planning and modeling satisfying the sustainability policy recommendations (k2)
3. Illustrate the Innovative building material for rural and urban areas satisfying low cost and Cost Cutting of Infrastructure (k3)
4. Describe the Vernacular Architecture and its impact on sustainability (k2)
5. Explain the concept and construction techniques of International and national level of green building (k2)
6. Identify the Concept, tools at international and national level process in green building certification (k2)

CO- PO,PSO MAPPING:

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

SEMESTER - V

20CEPL501 SDG NO. 4,8,9,12	PUBLIC HEALTH & SANITATION ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- This subject includes the list of experiments to be conducted for characterization of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage

LIST OF EXPERIMENTS:

ANALYSIS OF WATER SAMPLE

1. Sampling and preservation methods for water and wastewater (Demonstration only)
2. Measurement of Electrical conductivity and turbidity

3. Determination of fluoride in water by spectrophotometric method /ISE
4. Determination of iron in water (Demo)
5. Determination of Sulphate in water
6. Determination of Optimum Coagulant Dosage by Jar test
7. Determination of available Chlorine in Bleaching powder and residual chlorine in water

ANALYSIS OF WASTEWATER SAMPLE

1. Estimation of suspended, volatile and fixed solids
2. Determination of Sludge Volume Index in wastewater
3. Determination of Dissolved Oxygen
4. Estimation of B.O.D.
5. Estimation of C.O.D.
6. Determination of Ammonia Nitrogen in wastewater
7. Determination of coliform (Demonstration only)

REFERENCES:

1. APHA, "Standard Methods for the Examination of Water and Wastewater", 22nd Ed.Washington, 2012.
2. H.H. and Krist, H, "Laboratory Manual for the Examination of Water, Wastewater soil Rump", Second Edition, VCH, Germany, 3rd Edition, 1999.

ONLINE REFERENCES:

1. http://nptel.iitm.ac.in
2. http://www.filtersource.com

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl.No.	Description of Equipment	Quantity
1.	Oxygen analyzer	1
2.	Spectrophotometer	1
3.	Ion – selective electrode	1
4.	Sodium Potassium Analyzer – Flame Photometer	1
5.	Gas Chromatography	1
6.	Atomic absorption spectroscopy (Ni, Zn, Pb)	1
7.	Nephlo - turbidity meter	1
8.	BOD Analyser	1
9.	COD Analyser	1
10.	Jar Test Apparatus	1
11.	Conductivity Meter	1

12.	Hot Air Oven	1
13.	Muffle Furnance	1
14.	BOD Digester	1
15.	COD Digesteer	1

OUTCOMES:

Upon completion of the course, the student should be able to

1. Determine the fluorides, iron, sulphates in water. (K3)
2. Estimate optimum coagulant dosage by Jar test and available Chlorine in Bleaching powder and residual chlorine in water. (K2)
3. Identify the suspended, volatile and fixed solids, B.O.D and C.O.D in waste water.(K2)
4. Determine of Sludge Volume Index , dissolved oxygen , Ammonia Nitrogen in wastewater. (K3)

CO- PO, PSO MAPPING :

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

SEMESTER - V

20CEPL502 SDG NO. 4,9,11&15	SOIL MECHANICS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop skills to test the soils for their index and engineering properties
- Characterize the soil based on their properties.

LIST OF EXPERIMENTS

Determination Of Index Properties

1. Specific gravity of soil solids
2. Grain size distribution–Sieve analysis
3. Grain size distribution- Hydrometer analysis
4. Liquid limit and Plastic limit tests
5. Shrinkage limit and Differential free swell tests

Determination of Insitu Density And Compaction Characteristics

1. Field density Test (Sand replacement method)
2. Determination of moisture–density relationship using standard proctor compaction test.

Determination Of Engineering Properties

1. Permeability determination(constant head and falling head methods)
2. One dimensional consolidation test (Determination of co-efficient of consolidation only)
3. Direct shear test in cohesion less soil
4. Unconfined compression test in cohesive soil
5. Laboratory vaneshear testin cohesive soil
6. Tri-axial compression test in cohesionless soil (Demonstration only)
7. California Bearing Ratio Test

Teston Geosynthetics (Demonstration only)

1. Determination of apparent opening sizes and permeability. (Determination of tensile strength and interfacial friction angle.)

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

S.No	EQUIPMENTS	QUANTITY
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and Plastic limit apparatus	2 sets
4.	Shrinkage limit apparatus	3 sets
5.	Proctor Compaction apparatus	2 sets
6.	UTM of minimum of 20kN capacity	1
7.	Direct Shear apparatus	1
8.	Thermometer	2
9.	Sand replacement method accessories and core cutter method accessories	2
10.	Tri-axial Shear apparatus	1
11.	Three Gang Consolidation test device	1
12.	Relative Density apparatus	1
13.	Van Shear apparatus	1
14.	Weighing machine – 20kg capacity	1 No
15.	Weighing machine – 1kg capacity	3 No

OUTCOMES

On completion of this laboratory course, the student should be able to:

1. Determine Index Properties of soil samples(k3)
2. Identify Insitu Density And Compaction Characteristics of soil (k1)
3. Determine Engineering Properties of soil (k3)
4. Demonstrate on Teston Geosynthetics (k2)

CO- PO, PSO MAPPING :

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

SEMESTER - V

20CETE501 SDG NO. 4,11,15	LIVE-IN-LAB - III	L	T	P	C
		0	0	2	2

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To enable hands-on experience in the electronics hardware/Software domain
- To enable development of skill set for designing and realizing prototype electronic systems/simulation model

COURSE METHODOLOGY

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. The project work must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.
3. Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project
4. On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the coordinator and the project guide.

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks
3. Final evaluation Last week of the semester): 50marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

1. Perform literature survey to identify the gap and an application oriented research problem in the specific domain (K2)
2. Design and validate the proposed system using simulation (K3)
3. Implement the proposed system (K3)
4. Examine the obtained results and prepare a technical report (K4)
5. Publish the work in journals and apply for the patents.(K3)
6. Prepare for industrial environment and real time work (K3)

CO - PO, PSO MAPPING :

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

SEMESTER - V

20CETE501 SDG NO. 4,11,15	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – V **10**

Square Root And Cube Root, Logarithm, Volume and Surface Area, Permutation and Combination

UNIT II QUANTITATIVE ABILITY – VI **10**

Probability, Averages, Area, Odd Man Out, Crypt Arithmetic, Flowcharts

UNIT III REASONING ABILITY – III **8**

Data Interpretation Table Charts, Data Interpretation Bar Charts, Blood Relationship, Puzzles

UNIT IV VERBAL ABILITY – III **10**

Spellings, Selecting Words, Spotting Errors, Ordering of Words, Logical Sequence of Words

UNIT V CREATIVITY ABILITY – III **7**

Logical Puzzles, Playing Cards Puzzles, Clock Puzzles, Number Puzzles, Sudoku

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma

PYTHON PROGRAMMING & FIELD STUDY IN CIVIL ENGINEERING – PART 2

OBJECTIVES:

The course is designed to provide Strong knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.

The objective of the Field work is to enable the students to get practical training in Civil Engineering.

UNIT I INTRODUCTION, DATATYPES AND STRINGS, LIST & TUPLES **10**

DataTypes - Integer , Float , Boolean , String , List , Tuple , Dictionary and Sets. String - Concatenation and Replication, isalnum functions, Slicing Operation sorted() , reversed() , min() , max() , index() and count() function, packing and unpacking of data in a tuple

UNIT II DICTIONARY AND SETS and HANDLING **10**

Dictionary - del Keyword,. Sets - Frozen sets, Internal working of sets, add() ,

union() , intersection() and difference() method, symmetric_difference, clear() method, Operators in sets, Higher Order Functions - map , filter , reduce and lambda function, Random Library

UNIT III EXCEPTIONAL HANDLING, REGULAR EXPRESSIONS AND OBJECT ORIENTED PROGRAMMING 10

Exception Handling - All Error Categories, try , except , finally blocks, Raising an exception, Regular Expression, Object Oriented Programming - Types of Inheritence, Data encapsulation and Abstraction, Polymorphism, Method OverRiding, Operator overloading, operator overRiding,

UNIT IV SURVEYING 7

Radial contouring, Block contouring, Longitudinal and Cross Section levelling (L.S. & C.S.), Triangulation, Trilateration and Total station survey

UNIT V GEO-SCIENCE AND CONSTRUCTION MATERIALS WITH SUSTAINABILITY 8

Alignment of wall panels using Bricks and Stones, Strength analysis of concrete, Bearing capacity of Soil, Analysis of types of soil and its specification, Water analysis, Sewage analysis and Air pollution.

TOTAL : 45 PERIODS

REFERENCES:

1. Python-(Mark Lutz)
2. Python Training guide (BPB Publications)
3. B. C. Punmia, Ashok K. Jain and Arun K Jain, "Surveying Vol.I,II &III" Lakshmi Publications Pvt Ltd, New Delhi,2019.
4. Varghese.P.C, "Building Construction", Second Edition PHI Learning Ltd.,2017.
5. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
6. S.K.Garg, "Environmental Engineering" volume 1 and 2, Khanna publisher.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105102088/
3. https://nptel.ac.in/courses/105/103/105103097/

OUTCOMES

Upon completion of this course, the students will be able to:

1. Explain basic principles of Python programming language (K3)
2. Implement object oriented concepts (K3)
3. Implement database and GUI applications.(K3)
4. Applying modern survey techniques in field to establish horizontal and vertical controls.(K3)
5. Acquire the knowledge in fundamentals of geo science and Environmental engineering. (K2)
6. To study the application of sustainable materials in modern construction. (K2)

CO-PO-PSO MAPPING:

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

SEMESTER - VI

20CEPC601 SDG NO. 4,9&11	DESIGN OF STEEL STRUCTURES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections
- To provide the students the tools necessary for designing structural systems such as roof trusses and gantry girders as per provisions of current code(IS800 -2007)of practice

UNIT I INTRODUCTION TO STRUCTURAL STEEL AND DESIGN OF CONNECTIONS 9

General-Types of Steel-Properties of structural steel-I.S.rolled sections-Concept of Limit State Design-Design of Simple and eccentric Bolted and welded connections -Types of failure and efficiency of joint –prying action-Introduction to HSFG bolts

UNIT II TENSION MEMBERS 9

Behaviour and Design of simple and built-up members subjected to tension-Shear lag effect- Design of lug angles-tension splice

UNIT III COMPRESSION MEMBERS 9

Behaviour of short and long columns-Euler's column theory-Design of simple and built-up compression members with lacings and battens-Design of column bases- slab base and gusseted base.

UNIT IV BEAMS 9

Design of laterally supported and unsupported beams-Design of built-up beams-Design of plate girders.

UNIT V INDUSTRIAL STRUCTURES 9

Design of roof trusses –loads on trusses–purlin design using angle and channel sections –truss design, Design of joints and end bearings–Design of gantry girder - Introduction to pre-engineered buildings.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Duggal S.K., "Design of Steel Structures", Tata McGraw Hill, Publishing Co.Ltd., NewDelhi,2010
2. Bhavikatti S.S, "Design of Steel Structures", Ik International Publishing House,NewDelhi,2017

REFERENCES:

1. Gambhir ML, "Fundamentals of Structural Steel Design", Mc Graw Hill Education India Pvt Limited, 2013
2. Jack C.Mc Cormac and Stephen FC Sernak, "Structural Steel Design", Pearson Education Limited, 2013.
3. Sarwar Alam Raz, "Structural Design in Steel", New Age International Publishers, 2014
4. Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi, 2016
5. Design of Steel Structures,L.Negi,july 2017,Mc Graw Hill

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/106/105106112/
2. https://nptel.ac.in/courses/105/106/105106113/
3. https://nptel.ac.in/courses/105/105/105105162/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the Properties of different types of steel structures and connections satisfying Limit State Design (K2)
2. Illustrate the different types of failure and efficiency of joint (K3)
3. Analyse the behaviour of built-up members subjected to tension, Shear lag, lug angles and tension splice(K3)
4. Discriminate the Behaviour of short and long columns by Euler's column theory and application to compression members (K3)
5. Analyse laterally indeterminate beams and plate girders(K3)
6. Analyse the indeterminate trusses and gantry girders and its introduction to pre engineered buildings(K3)

CO- PO, PSO MAPPING:

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

SEMESTER - VI

20CEPC602 SDG NO. 4,9 &11	RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the students about planning, design, construction and maintenance and design principles of Railways, Airport and Harbour

UNIT I RAILWAY PLANNING AND CONSTRUCTION 10

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods - Geometric design of railway, gradient, super elevation, widening of gauge on curves - Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 8

Earthwork–Stabilization of track on poor soil-Tunneling Methods, drainage and ventilation–Calculation of Materials required for tracklaying - Construction and maintenance of tracks – Signaling - Railway Station and yards and passenger amenities

UNIT III AIRPORT PLANNING 7

Air transport characteristics - airport classification - airport planning: objectives, components, layout characteristics, socio-economic

characteristics of the Catchment area, airport site selection - Orientation of Runways and correction factors as ICAO stipulations, typical Airport Layouts, parking and Circulation Area.

UNIT IV AIRPORT DESIGN 10

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design, Configuration and Pavement Design Principles – Elements of Taxi way Design – Airport Zones – Passenger Facilities and Services – Runway and Taxi way Markings.

UNIT V HARBOUR ENGINEERING 10

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides - Planning and Design of Harbors: Requirements, Classification, Location and Design Principles – Harbor Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Environmental concern of Port Operations – Coastal Regulation Zone, 2011

TOTAL:45PERIODS

TEXTBOOKS:

1. Subramanian K.P., Highways, Railways, "Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010
2. C.Venkatramaiah., "Transportation Engineering - Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels", Universities Press (India) Pvt. Limited, Hyderabad, 2015.

REFERENCES:

1. Vazirani. V. NandChandola. S. P, "Transportation Engineering - Vol.II", Khanna Publishers, NewDelhi, 2015.
2. Mundrey JS, "Railway Track Engineering", Mc Graw Hill Education (India) Private Ltd, NewDelhi, 2013.
3. Saxena Subhash, C. and Satyapal Arora, "A Course in Railway Engineering", Dhanapat Rai and Sons, Delhi,1998
4. Khanna. S. K. Arora. M. G and Jain. S. S, "Airport Planning and Design", Nemachand and Bros, Roorkee, 1994
5. Srinivasan R. "Harbour Docks and Tunnel Engineering", Charotar publishing house Pvt. Ltd., 2016.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/107/105107123/
2. https://nptel.ac.in/courses/114106025/
3. http://www.iricen.gov.in/iricen/ELearning.jsp

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the various functions and its effect on track stresses of Rails, Sleepers, ballast, fixtures and fastenings [K3]
2. Describe the conventional and modern methods adopted for the construction of new railway track [K2]
3. Describe the various construction and maintenance of railway track and bring out the importance of track drainage [K2]
4. Gain an insight on the planning and site selection of Airport Planning and design [K3]
5. Analyze and design the elements for orientation of runways and passenger facility systems [K3]
6. Understand the various feature in Harbors and Ports, their construction, coastal protection works and coastal Regulations to be adopted (K2)

CO - PO, PSO MAPPING:

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

SEMESTER - VI

20CEPC603 SDG NO. 4,9&11	STRUCTURAL ANALYSIS - II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses
- To analyze the arches, suspension bridges and space trusses
- Also, to learn Plastic analysis of beams and rigid frames

UNIT I INFLUENCE LINES FOR DETERMINATE BEAMS 9

Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.

UNIT II INFLUENCE LINES FOR INDETERMINATE BEAM 9

Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

UNIT III ARCHES 9

Arches - Types of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects.

UNIT IV CABLES AND SUSPENSION BRIDGES 9

Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders - cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT V PLASTIC ANALYSIS 9

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. S.S Bhavikatti, "Structural Analysis, Vol.1 & 2", Vikas Publishing House Pvt.Ltd., New Delhi - 4, 2014.
2. B.C Punmia., Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi, Publications,2004.

REFERENCES:

1. Vazrani. V. N And Ratwani. M. M, "Analysis of Structures", Vol.II, Khanna Publishers, 2015.
2. Negi. L. S and Jangid R. S., "Structural Analysis", Tata Mc Graw - Hill Publishers, 2004.
3. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co. Ltd., 2002.
4. Gambhir. M. L., "Fundamentals of Structural Mechanics and Analysis", PHIL earning Pvt. Ltd.,2011.
5. Prakash Rao D.S., "Structural Analysis", Universities Press,1996.

ONLINE RESOURCES:

1. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m5l32.pdf
2. https://eng.libretexts.org/Bookshelves/Civil_Engineering/Book%3A_Structural_Analysis_(Udoeyo)/13%3A_Influence_Lines_for_Statically_Indeterminate_Structures

OUTCOMES:

Upon completion of the course, the student should be able to

1 Analyse the reactions, critical stresses, maximum bending moment of Determinate and Indeterminate Beams Using Influence Lines (K3)

2 Determine absolute maximum bending moment in Pin Jointed Plane Frames Using Influence Lines (K3)

3 Apply Muller Breslaus Principle for Developing Influence Line to Analyse shear force, bending moment and support reactions of Indeterminate Structures (K2)

4 Analyse reactions and stresses in circular, parabolic -Two Hinged, Three Hinged and Fixed Arches (K3)

5 Analyse Equilibrium and Anchorage of Suspension Bridges with three hinged Stiffening Girders (K3)

6 Apply Plastic Analysis Method using static and Kinematic methods - upper bound, lower bound theorem to Compute Collapse Load in Beams and Frames (K2)

CO- PO, PSO MAPPING:

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

SEMESTER - VI

20CEPL601 SDG NO. 4 & 9	HIGHWAY ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn the principles and procedures of testing of materials used in the construction of highways

LIST OF EXPERIMENTS

I Test On Aggregates

1. Sieve Analysis
2. Flakiness and Elongation Test of Aggregates.
3. Specific Gravity of Aggregates.
4. Aggregate Impact Value
5. Los Angeles Abrasion Test
6. Water Absorption of Aggregates

II Test On Bitumen

1. Specific Gravity of Bitumen
2. Penetration Test
3. Viscosity Test
4. Softening Point Test
5. Ductility Test

III Bituminous Mixes – Demonstration classes only.

1. Determination of Binder Content

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

Equipments

1.	Concrete cube moulds	6 nos.
2.	Concrete cylinder moulds	3 nos.
3.	Concrete Prism moulds	3 nos.
4.	Sieves	1 Set
5.	Concrete Mixer	1 no.
6.	Slump cone	3 nos.
7.	Flow table	1 no.
8.	Vibrator	1 no.
9.	Trovels and planers	1 Set
10.	UTM – 400 kN capacity	1 no..
11.	Vee Bee Consistometer	1 no.
12.	Aggregate impact testing machine	1 no.
13.	CBR Apparatus	1 no.
14.	Blains Apparatus	1 no.
15.	Los - Angeles abrasion testing machine	1 no.

REFERENCES:

1. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition, 2009.
2. Methods for testing tar and bituminous materials, IS 1201–1978 to IS 1220– 1978, Bureau of Indian Standards.
3. Methods of test for aggregates, IS 2386 – 1978, Bureau of Indian Standards.
4. Mix Design Methods Asphalt Institute Manual Series No. 2, Sixth Edition, 1997, Lexington, KY, USA

OUTCOMES

On completion of this laboratory course, the student should be able to

1. Determine the properties of aggregates by Sieve analysis, Flakiness & Elongation index and Specific gravity test (K2)
2. Determine the properties of aggregates by Impact test, Los Angeles abrasion test and Water absorption test.(K2)
3. Study the properties of bitumen by Specific Gravity test, Penetration test, Viscosity test, Softening Point test and Ductility test. (K2)

4. Demonstrate testing equipment like binder content of bituminous mixes.(K2)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Co1	3	2	2	3	2	1	-	2	1	1	2	1	2	2
CO2	3	2	2	3	2	1	-	2	1	1	2	1	2	2
CO3	3	2	2	3	2	1	-	2	1	1	2	1	2	2
CO4	2	1	1	1	2	-	-	1	1	-	2	1	2	1

SEMESTER - VI

20HSPL501 SDG NO. 4, 8	COMMUNICATION AND SOFT SKILLS LAB	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To develop effective communication and presentation skills
- To enhance the employability and career skills of the learners
- To enable the learners for preparing job application and e-portfolio
- To make the learners use soft skills efficiently
- To develop their confidence and help them in attending interviews successfully

UNIT I LISTENING AND SPEAKING SKILLS **6**

Conversational skills participate in formal and informal talks – general, – group discussion – time management – group dynamics – GD strategies - making effective presentations - listening/watching interviews conversations, documentaries - listening to lectures, discussions from social media – improving articulation.

UNIT II ADVANCED READING AND WRITING SKILLS **6**

Reading different genres of texts - writing job applications – cover letter – résumé – emails – memos - writing abstracts – summaries – interpreting visual texts - e-portfolio.

UNIT III SKILLS FOR COMPETITIVE EXAMS **6**

Reading passages for competitive exams – language focus exercise – building vocabulary tasks - FAQs related to competitive exams – current affairs - improving global reading skills – elaborating ideas – summarizing – understanding arguments – identifying opinion/attitude and making inferences - critical reading.

UNIT IV SOFT SKILLS **6**

Motivation – emotional intelligence – managing changes – stress management – leadership straits – team work – career planning – intercultural communication – creative and critical thinking

UNIT V INTERVIEW SKILLS **6**

Different types of interview – personal interview – panel interview – telephone/online interview - interview etiquette - answering questions – offering information – mock interviews – FAQs related to job interviews

TOTAL: 30 PERIODS

REFERENCES:

1. Business English Certificate Materials, Cambridge University Press.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge, 2011.
3. International English Language Testing System Practice Tests, Cambridge University Press.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.

WEB REFERENCES:

1. https://nptel.ac.in/courses/109/107/109107121/
2. https://swayam.gov.in/nd1_noc19_hs33/preview
3. https://ict.iitk.ac.in/courses/enhancing-soft-skills-and-personality/

ONLINE RESOURCES:

1. https://www.britishcoucil.my/english/courses-adults/learning-tips/importance-of-soft-skills
2. https://www.skillsoft.com/content-solutions/business-skills-training/soft-skills-training/

OUTCOMES:

Upon completion of the course learners should be able to

1. Demonstrate a better understanding of the communication process by articulating effectively(K2)
2. Exhibit soft skills & technical skills and construct e-portfolio effectively(K3)

3. Apply critical thinking abilities and perform well in group discussions(K2)
4. Adapt the skills towards grooming as a professional continuously(K2)
5. Identify different types of personal interview skills through mock interviews and practices(K2)
6. Execute the employability and career skills in their chosen profession(K3)

CO - PO MAPPING:

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

SEMESTER - VI

20CEPJ601 SDG NO. 4, 6, 7, 8, 9, 11, 12, 13, 17	INNOVATIVE DESIGN PROJECT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 2 to 4 and work under a project supervisor. The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

OUTCOMES:

Upon completion of the course, the students should be able to

1. Discuss the societal needs and acquire knowledge about innovation (K2)
2. Illustrate the importance of sustainable development to satisfy the needs of public (K3)
3. Demonstrate experimental models to enhance the innovation (K3)
4. Construct innovative models equipping the hands on training in fabrication (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Co1	3	3	3	2	3	2	3	3	3	3	3	3	3	3
CO2	2	2	3	1	3	3	3	3	3	3	3	3	3	3
CO3	3	1	-	-	3	-	2	3	3	3	1	3	3	3
CO4	3	1	-	-	3	-	2	3	3	3	1	3	3	3

SEMESTER - VI

20CETE601 SDG NO. 4,11,15	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

UNIT I QUANTITATIVE ABILITY – VII **10**

Races And Games, Boats and Streams, Surds and Indices, Pipes and Cistern, Alligations And Mixtures

UNIT II QUANTITATIVE ABILITY – VIII **10**

Numbers, Problems on Numbers, Pick Wrong Number, Missing Number, Areas, Shapes, Perimeter

UNIT III REASONING ABILITY – IV **8**

Data Interpretation Pie Charts, Data Interpretation Line Charts, Data Sufficiency (DS), Data Arrangements, LR – Arrangements, LR – Ranking.

UNIT IV VERBAL ABILITY – IV **10**

Sentence Correction, Sentence Improvement, Completing Statements, Sentence Formation, Paragraph Formation

UNIT V CREATIVITY ABILITY – IV **7**

Dot Situation, Rule Detection, Embedded Images, Grouping Of Images, Image Analysis

TOTAL:45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma

PROBLEM SOLVING USING BASIC DATA STRUCTURES & ANALYSIS AND FABRICATION OF PROTOTYPE STRUCTURAL ELEMENTS – PART 2

OBJECTIVES:

- The objective of the course is to familiarize students with basic data structures and their use in fundamental algorithms.
- To create exposure to students on prototype fabrication of structural elements in Civil Engineering
- To impart knowledge in design and analysis of prototype elements.

UNIT I LINKED LIST & STACK, QUEUE & HEAP **10**

Linked List - Doubly Linked List Traversal, Circular Linked List, Structure, Node creation, Traversal Stack, Stack –Time Complexities of the Operations, Infix to Postfix/Prefix Conversation, Histogram Problem, Implementation - Using Array, Using Linked List, Queue Implementation - Queue using Stack

UNIT II BINARY TREE AND HASHING **10**

Binary Tree - Types of Binary Tree,Balanced Tree, Degenerate or pathological Tree, Binary Search Tree, Inorder , Preorder , PostOrder and LevelOrder Traversal, Hashing, Linear Probing for Collision Handling, Union and Intersection of two Linked Lists

UNIT III TREES AND GRAPH 10

AVL Tree -Right-Left Imbalance, Left and Right Rotation, - Red Black Tree, Rules of coloring Left and Right Rotation,Graph terminology –Representation of graphs –Path matrix –Graph Traversal –BFS (breadth first search) –DFS (depth first search) –Minimum spanning Tree –Kruskal's Algorithm & Prim's Algorithm –Warshall's algorithm (shortest path algorithm).

UNIT IV STUDY ON ANALYSIS OF FABRICATED ELEMENTS 7

Analysis of structural specification - detailed plan and sectional elevation-determining the loads and design calculation-Selection of materials-moulding and casting of individual elements-fabrication and analysis of elements.

UNIT V FABRICATION OF STRUCTURAL ELEMENTS WITH ALTERNATE MATERIALS 8

Identification of alternate materials-study of properties and its feasibility for fabrication of prototype of structural elements-Design and analysis of structural elements-comparison with conventional materials.

TOTAL : 45 PERIODS

REFERENCES:

1. Weiss, Mark. A. (2012), Data structures and algorithm analysis in Java. 3rd edition. Harlow, Essex : Pearson (632 p).
2. Zobel, Justin (2014), Writing for Computer Science. 3 edition. Springer Verlag London Ltd (270 p).
3. Krishnamurthy D,Structural Design and Drawing VolI,II and III,CBS Publishers,2010.
4. Design of Reinforced Concrete Structures by S.Ramaamutham.
5. Design of steel structures by S.S Bhavikatti

ONLINE RESOURCES:

1. https://www.kloecknermetals.com/blog/what-to-know-about-the-fabrication-of-structural-st eel/

WEB RESOURCES:

1. https://www.bca.gov.sg/Publications/EnhancementSeries/others/Chapter4.pdf

OUTCOMES

Upon completion of this course, the students will be able to:

1. Data abstraction and information hiding. (K3)
2. linear data structures and their applications in problem solving and programming. (K3)
3. Nonlinear data structures and their applications in problem solving and programming. (K3)
4. Internal and external sort and search techniques. (K3)
5. Understand and execute Civil and Structural fabrication works. (K3)
6. Acquire adequate knowledge in design and analysis of prototype elements. (K3)

CO-PO-PSO MAPPING:

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

SEMESTER - VII

20CEPW701 SDG NO. 4, 9 & 11	ESTIMATION AND QUANTITY SURVEYING WITH LAB	L	T	P	C
		2	0	2	4

OBJECTIVES:

- To impart knowledge in estimation, tender practices, contract procedures, and valuation of Civil Engineering works

UNIT I QUANTITY ESTIMATION **9**

Philosophy–Purpose–Methodsofestimation–Typesofestimates–Approximate estimates – Detailed estimate – Estimation of quantities for buildings, roads, canals and hydraulic structures using computer softwares.

UNIT II RATE ANALYSIS AND COSTING **9**

StandardData– Observed Data – Schedule of rates–Market rates–Assessment of Man Hours and Machineries for common civil works – Rate Analysis –Cost Estimates using Computer softwares.

UNIT III SPECIFICATIONS, REPORTS AND TENDERS **9**

Specifications–Detailed and general specifications–Constructions –Sources–Types of specifications – Principles for report preparation–report on estimate of residential building– Culvert–Roads- TTT Act2000–Tendernotices–types–tenderprocedures–Draftingmodel tenders, E-tendering-Digital signature certificates-Encrypting -Decrypting–Reverseauctions.

UNIT IV CONTRACTS **9**

Contract–Typesofcontracts–Formationofcontract–Contractconditions–Contract for labour, material, design, construction – Drafting of contract documents based on IBRD /MORTH Standard bidding documents– Construction contracts –Contract problems–Arbitration and legal requirements.

UNIT V VALUATION **9**

Definitions – Various types of valuations– Valuation methods– Valuation of land – Buildings – Valuation of plant and machineries- Calculation of Standard rent–Mortgage–Lease.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. B.N Dutta "Estimating and Costing in Civil Engineering", UBS Publishers&Distributors(P) Ltd, 2010.
2. B.S.Patil, "Civil Engineering Contracts and Estimates", University Press,2006.
3. Hand Book of Consolidated Data–8/2000, Vol.1,TNPWD.
4. Tamil Nadu Transparencies in Tenders Act,2000.
5. Standard Databook for analysis and rates.
6. Standard Bid Evaluation Form, Procurement of Goodor Works, TheWorldBank, April 1996.

REFERENCES:

1. PWD Data Book.
2. Tamilnadu Transparencies in Tender Act, 1998
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank, April 1996.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/103/105103023/
2. https://nptel.ac.in/courses/105/103/105103093/
3. https://freevideolectures.com/subject/civil-engineering/
4. https://www.slideshare.net/IDHAMUKI/measurement-pdf-88552504
5. https://www.slideshare.net/archistudentportal/contracts-and tenders?qid=f4d9d55a-961b-485b-8f97-9d6d0b48d8c0&v=&b=&from_search=1

ONLINE RESOURCES :

1. https://www.youtube.com/watch?v=ofkpm4lhJcg
2. https://freevideolectures.com/course/3354/port-and-harbour-structures/11
3. https://www.udemy.com/course/quantity-surveyingbuilding-estimation/

OUTCOMES:

Upon completion of the course, the student should be able to

1 Explain the basic concept of quantity estimation for building, roads, canals and hydraulic structures by manual and software packages. (K2)
2. Calculate rate analysis and man-hours required for the common civil works by manual and software packages. (K3)

3. Describe the specification for the materials used in construction report preparation. (K2)
4. Summerize the tender procedures and tender document preparation (k2)
5. Describe the different methods of contracts and contract document preparation. (K2)
6. Identify the valuation for building, land, plant and machineries, calculation of rent, mortgage and lease. (K2)

CO– PO, PSO MAPPING :

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

SEMESTER - VII

20CEPC701 SDG NO. 4 & 6	WATER RESOURCES AND IRRIGATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- The student is exposed to different phases in Water Resources Management and National Water Policy. Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including Irrigation and Irrigation management practices

UNIT I WATER RESOURCES 9

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-levees and flood walls.

UNIT II WATER RESOURCE MANAGEMENT 9

Economics of water resources planning; – National Water Policy – Consumptive and non-consumptive water use - Water quality – Scope and

aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water

UNIT III IRRIGATION ENGINEERING 9

Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water.

UNIT IV CANAL IRRIGATION 9

Types of Impounding structures: Gravity dam – Diversion Head works - Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining - Kennady's and Lacey's Regime theory

UNIT V IRRIGATION METHODS AND MANAGEMENT 9

Lift irrigation – Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation - Merits and demerits – Irrigation scheduling – Water distribution – Participatory irrigation management with a case study

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
2. Punmia B.C., et. al; "Irrigation and water power Engineering", Laxmi Publications, 16th Edition, New Delhi, 2009

REFERENCES

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.
3. Michael A.M., "Irrigation Theory and Practice", 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
4. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
5. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=RTR2RgMbJ-g
2. https://freevideolectures.com/course/100/water-resources-engineering

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Explain water resources planning and estimation of water requirement (K2)
2. Discuss types of economics of water Resources Management satisfying National Water Policy(K2)
3. Describe different types of irrigation efficiencies and crop water requirements for estimation of Consumptive use of water(K2)
4. Classify different types of impounding structures like dams and Diversion Head works(K3)
5. Extend on canal outlets in line with Cross drainage works (K2)
6. Illustrate on various methods of irrigation and irrigation management (K3)

CO- PO, PSO MAPPING:

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

SEMESTER - VII

20CEPC702 SDG NO. 4,9&11	ADVANCED REINFORCED CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To give an exposure to the design of continuous beams
- To give an exposure to the design of slabs
- To give an exposure to the design of, staircases, walls
- To give an exposure to the design of brick masonry structures
- To introduce yield line theory

UNIT I RETAINING WALLS **9**

Design of Cantilever and Counter fort Retaining walls

UNIT II WATER TANKS **9**

Design of rectangular and circular water tanks both below and above ground level.

UNIT III SPECIAL TOPICS **9**

Design of staircases (ordinary and doglegged)– Design of flat slabs–Principles of design of mat foundation, box culvert and road bridges.

UNIT IV YIELD LINE THEORY **9**

Assumptions - Characteristics of yield line-Determination of collapse load /plastic moment- Application of virtual work method - square, rectangular, circular and triangular slabs -Design problems.

UNIT V SHEAR WALL **9**

Analysis and design of shear wall framed buildings.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Advanced Reinforced Concrete Structures, B.C.Punmia.Ashok K.Jain and Arun K. Jain, PHI Learning Pvt. Ltd., 2009.
2. Design Of Reinforced Concrete Structures , Gambhir ML, PHI Learning Pvt. Ltd. 2008.

REFERENCES:

1. Unni Krishna Pillai and Dev das Menon, Reinforced Concrete Design (ThirdEdition),TataMc GrawHill Publishing Company Ltd., NewDelhi, 3rd

Edition, 2017.
2. N.Subramanian, "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2014.
3. P.C.Varghese, "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd., New Delhi, Second Edition,2008.
4. S.N.Sinha, "Reinforced Concrete Design", Tata Mc Graw-Hill, New Delhi, 2002.
5. Jain A.K. "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998.

IS CODES

1. IS 456:2000 Plain and Reinforced Concrete– Code of Practice.
2. IS 875(1-5):1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures.
3. SP 16:1980 Design Aids for Reinforced Concrete to IS 456:1978.
4. SP 34:1987Handbookofconcretereinforcement and detailing.
5. National Building Code of India2016(NBC 2016)

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/105/105105104/
2. https://www.ndl.gov.in/
3. http://www.brainkart.com/subject/Design-of-Reinforced-Concrete-and-Brick-Masonry-Structures_32/

ONLINE RESOURCES:

1. http://www.downloadmela.com/search/?q=CE6601 Design of Reinforced Concrete and Brick Masonry Structures
2. https://www.classcentral.com/course/swayam-design-of-reinforced-concrete-structures-13995

OUTCOMES:

Upon completion of the course, the student should be able to

1. Calculate various design components of Cantilever and Counter fort Retaining walls (K3)
2. Solve the stability parameters of rectangular and circular water tanks both below and above ground level (K2)
3. Calculate different stability parameters of RC slab and stair case and draw the reinforcement details (K3)
4. Analyse the principles of design of mat foundation, box culvert and road bridges (K3)

5. Describe the Characteristics features of yield line and its application to virtual work method (K2)
6. Apply the design principles of shear wall framed buildings (K3)

CO- PO, PSO MAPPING:

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

SEMESTER - VII

20CEPL701 SDG NO. 4 & 9	COMPUTER AIDED DESIGN & DRAFTING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

LIST OF EXPERIMENTS:

1. Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details
2. Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details.
3. Design and drafting of circular and rectangular RCC water tanks
4. Design of plate Girder Bridge - Truss Girder bridges – detailed Drawings including connections
5. Design of hemispherical bottomed steel tank

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity
1.	Models of Structures	1 each
2.	Computers Pentium IV	30 Nos

3. Analysis and Design Software - Minimum 5 use License 1 No

TEXTBOOKS:

1. Krishnaraju,N. "Structural Design & Drawing, Universities Press, 2009.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain,Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy, D., "Structural Design & Drawing – Vol. II and III, CBS Publishers, 2010.
2. Shah V L and Veena Gore, "Limit State Design of Steel Structures IS800-2007, Structures Publications, 2009.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Demonstrate and draw RCC cantilever and counter fort type retaining walls with reinforcement details
2. Demonstrate solid slab and RCC Tee beam bridges for IRC loading and reinforcement details
3. Sketch circular and rectangular RCC water tanks with design details
4. Show the reinforcement details of plate Girder Bridge, Truss Girder bridges and hemispherical bottomed steel tank

CO- PO, PSO MAPPING :

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

SEMESTER - VII

20CEPJ701 SDG NO. 4, 6,7, 8, 9,11,12,13,17	PROJECT PHASE - I	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same
- To train the students face reviews and viva voce examination

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 3 to 4 and work under a project supervisor and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor (faculty member). The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department. The Project Work Phase-I will have the following Sequence:

I. Problem Identification

1. A statement of system / process specifications proposed to be developed (Block Diagram / Concept tree)
2. List of possible solutions including alternatives and constraints
3. Cost benefit analysis
4. Time Line of activities

II. A report highlighting the design finalization

[based on functional requirements and standards (if any)]

III. A presentation including the following:

1. Implementation Phase (Hardware / Software / both)
2. Testing and Validation of the developed system
3. Learning in the Project

IV. Consolidated report preparation

TOTAL: 60 PERIODS

OUTCOMES

Upon completion of the course, the students should be able to

1. Comprehend an industrial or real life problem and identify right/ real issue with solution.
2. Complete the necessary studies and review the literature, design a setup of equipment, complete the analysis.
3. Write a project report based on the findings.

CO- PO & PSO MAPPING:

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

SEMESTER - VII

20CETE701 SDG NO. 4,11,15	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	2

APTITUDE & TECHNICAL REFRESHER, COMPANY SPECIFIC TRAINING & FUNDAMENTAL ANALYSIS OF STRUCTURES

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability.
- Enhance their verbal ability.
- Exposure to students in creating three dimensional concepts and colourful renditions.
- Train the students in Structural Modelling, Designing and Analysis, Integrated Design and Finite Element Analysis.

UNIT I PRODUCT COMPANY SPECIFIC TRAINING – I 10

Product Specific Training for Amazon, Microsoft, IBM, ThoughtWorks, Juspay, Paypal, Mu Sigma, Zoho Corporation, VM Ware, Directi, Oracle, Wells Fargo, Goldman Sachs, Chargebee, Coda Global, Temenos, Freshworks, Adobe Systems., Ernst and Young, BA Continuum, Standard Chartered, AON Hewitt, Soliton Technologies, Payoda Technologies, Infoview Technologies,Athena Health Technology.

UNIT II PRODUCT COMPANY SPECIFIC TRAINING – II 10

Product Specific Training for TCS,Wipro,TechMahindra, InfoView, RobertBosch, , NTT Data, Verizon, Payoda Technologies. CTS, Accenture, MindTree, MPhasis, Odessa Technologies, Vuram Technologies, Hewlett Packard, HCL.

UNIT III SERVICE COMPANY SPECIFIC TRAINING - I 10

Capgemini, Infosys, IBM, UGAM Solutions, Skava Systems, L&T Infotech, Bahwan Cybertech, Dhyan Infotech.

UNIT IV GOOGLE SKETCH-UP 6

Interface basics- Adding toolbars – Navigating - Changing perspective - Walking around - Creating camera view - Shading faces and edges -Creating shadows and fog - Creating Scenes - Setting preferences - Basic animation – Creating a 3D Building Model.

UNIT V STADD PRO 9

Model Generation and Editing - Assigning loads - Creating Load Combinations -Concrete Design – Seismology - Steel Design - Foundation Designs - Report Generation and Plotting.

TOTAL: 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma
5. Learning Bentley Staad.Pro V8I for Structural June 2015 by Sham Tickoo
6. Exploring Bentley Staad.Pro Connect Edition. by Prof. Sham Tickoo/TIET,BPB Publications.
7. Introduction to Google SketchUp, Aidan Chopra (Author), Laura Town Chris Pichereau

ONLINE RESOURCES:

1. https://communities.bentley.com/cfs-file/__key/telligent-evolution-components-attachments/13-275895-00-00-00-24-18-54/technical_5f00_reference_5f00_v8i.pdf

WEB RESOURCES:

1. https://communities.bentley.com/products/ram-staad/w/structural_analysis_and_design__wiki/8437/ where-do-i-find-the-staad-pro-tutorials-trainings-videos-seminars

OUTCOMES:

Upon completion of the course, the Students should be able to:

1. Enhance their quantitative ability.(K2)
2. Enhance their reasoning ability.(K2)
3. Enhance their verbal ability.(K2)
4. Exposure to students in creating three dimensional concepts and colourful renditions(K2)
5. Create architectural shapes and objects using the three-dimensional tools provided by the google sketchup software and program.(K3)
6. Know the application of different types of loads like dead load, live load, earthquake load, wind load.(K2)

CO-PO-PSO MAPPING:

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

SEMESTER - VIII

20CEPJ801 SDG NO. 4, 6, 7, 8, 9, 11, 12, 13, 17	PROJECT PHASE-II	L	T	P	C
		0	0	8	4

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same
- To train the students face reviews and viva voce examination

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 3 to 4 and work under a project supervisor. a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department. The Project Work Phase-II will follow the following Sequence:

I. Problem Identification

1. A statement of system / process specifications proposed to be developed (Block Diagram / Concept tree)
2. List of possible solutions including alternatives and constraints
3. Cost benefit analysis

I Time Line of activities

II. A report highlighting the design finalization [based on functional requirements and standards (if any)]

III. A presentation including the following:

1. Implementation Phase (Hardware / Software / both)
2. Testing and Validation of the developed system
3. Learning in the Project

IV. Consolidated report preparation

TOTAL: 180 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to

1. Comprehend an industrial or real life problem and identify right/ real issue with solution.
2. Complete the necessary studies and review the literature, design a setup of equipment, complete the analysis.
3. Write a project report based on the findings.

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Co1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2

PROFESSIONAL ELECTIVES - I

20CEEL501 SDG NO. 4,9,11	HOUSING PLANNING & MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
- The course focuses on cost effective construction materials and methods
- Emphasis is given on the principles of sustainable housing policies and programme

UNIT I INTRODUCTION TO HOUSING 10

Definition of Basic Terms – House, Home, Household, Apartments, Multistoried Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 10

Basic Concepts, Contents and Standards for Housing Programme - Sites and Services, Neighborhoods - Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programme – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects, Role of Public housing agencies, and Private sector in supply, quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Land Use and Soil suitability analysis - Building By laws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation

UNIT IV CONSTRUCTION TECHNIQUES AND COST EFEECTIVE MATERIALS 8

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction - Green building concept - Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 8

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy - Public Private Partnership Projects – Viability Gap Funding - Pricing of Housing Units (Problems)

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt.Ltd. NewDelhi, 1999
2. Francis Cherunilam and Odeyar D Heggade, “Housing in India", Himalaya Publishing House, Bombay, 1997

REFERENCES:

1. Wiley-Blackwell, "Neufert Architects" Data, 4th Edition, Black well Publishing Ltd, 2012
2. Donald Watson and Michael J. Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata Mc Graw Hill Edition, 2011
3. Walter Martin Hosack, "Land Development Calculations", Mc Graw Hill 2nd Edition, USA, 2010
4. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004
5. Government of India, National Housing Policy, 1994.

ONLINERESOURCES:

1. https://nptel.ac.in/courses/124107001
2. https://www.in.undp.org/content/india/en/home/operations/projects/poverty_reduction/rural-housing.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Make use of the basic terms of housing, housing laws and control regulations [K2]
2. Study the various housing programme undertaken in India [K2]
3. Identify the role of public, private and non-government organizations [K2]
4. Identify the different types of sites and improve their knowledge in design and evaluation [K3]

5. Choose the effective materials for construction [K2]
6. Use of finance assistance given by government [K2]

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL502 SDG NO. 4, 9	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects
- To learn operating principle of sensors used to measure various physical parameters

UNIT I INTRODUCTION **9**

Impacts of Development on Environment –Sustainable Development and Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types EIA in project cycle – EIA Notification and Legal Framework in India – Selection & Registration Criteria for EIA Consultants Stakeholders and their Role in EIA

UNIT II ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference - Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna – Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives

UNIT III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Environmental Clearance – Post Project Audit

UNIT IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socioeconomic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan – Economic valuation of Environmental impacts – Cost benefit Analysis- Public Consultation

UNIT V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Real Estate Development – Roads and Bridges – Mass Rapid Transport Systems – Ports and Harbor – Airports – Dams and Irrigation projects - Waste Processing and Disposal facilities Mining Projects

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu. (1997). Environmental Impact Assessment for Developing Countries in Asia. Volume1– Overview, Asian Development Bank
2. Peter Morris, RikiTherivel (2009)," Methods of Environmental Impact Assessment", Routledge Publisher

REFERENCES:

1. Becker H. A., Frank Vanclay (2003), The International handbook of social impact assessment: conceptual and methodological advances, Edward Elgar Publishing
2. Barry Sadler and Mary McCabe (2002), "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme.
3. Judith Petts, Handbook of Environmental Impact Assessment Vol. I and II, Blackwell Science, New York, 1998.
4. Ministry of Environment and Forests (2010), EIA Notification and Sectoral Guides, Government of India, New Delhi.

5. Canter, R.L (1995). Environmental impact Assessment, 2nd Edition, McGraw Hill Inc., NewDelhi.

ONLINE RESOURCES:

1. https://www.wbcsd.org/Sector-Projects/Cement-Sustainability- Initiative/Resources/Guidelines-for-Environmental-and-Social- Impact-Assessment-ESIA
2. https://swayam.gov.in/nd2_nou20_ag05/preview
3. https://www.iitr.ac.in/departments/HRE/uploads/standards_pdf/ 1.9_ Environment_impact_assessment.pdf

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Explain Sustainable Development and Environmental Impact Assessment satisfying Selection & Registration Criteria for EIA Consultants Stakeholders (K2)
2. Explain different methodologies for environmental impact prediction and assessment in EIA (K2)
3. Illustrate matrices and networks for Mathematical models in EIA Impact prediction (K2)
4. Prepare Environmental Monitoring Plan and review of EIA report for mitigation of adverse impact on water, air and land, water, energy, flora and fauna (K2)
5. Identify socioeconomic investigation of the environment in a project fulfilling the Cost benefit Analysis (K2)
6. Prepare Knowledge level environmental impact assessment case study reports by various developmental activities (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL503 SDG NO. 4, 9 & 11	PAVEMENT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and evaluate the serviceability conditions of pavements.

UNIT I PAVEMENT TYPES AND STRESS DISTRIBUTION 8

Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 10

Flexible pavement design Factors influencing design of flexible pavement, Empirical Mechanistic empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III DESIGN OF RIGID PAVEMENTS 9

Cement concrete pavements Factors influencing CC pavements – Modified Westergaard's approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV PAVEMENT CONSTRUCTION, EVALUATION AND MAINTENANCE 10

Construction of pavements – Construction Equipment - Methods of construction. Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index - Pavement maintenance (IRC Recommendations only).

UNIT V STABILIZATION OF PAVEMENTS 8

Stabilization with special reference to highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geo synthetics in roads.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Khanna.S.K., Justo.C.E.G. and Veeraragavan.A, Highway Engineering, Nem Chand & Bros Publishers, 2014
2. R. Srinivasa Kumar, "Pavement Engineering" Universities Press (India) Private Limited, Hyderabad, 2013.

REFERENCES:

1. Rajib B.Mallickand, Tahar Elorchi, "Pavement Engineering Principles and Practice", CRC Press, 2009
2. Kadiyali. L. R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, NewDelhi, 2005.
3. Guidelines for the Design of Flexible Pavements, IRC-37–2012, The Indian Roads Congress, NewDelhi.
4. Guideline for the Design of Rigid Pavements for Highways, IRC 58-2012, The Indian Road Congress, NewDelhi.
5. Rashad Islam. M, Rafiqul A. Tarefder, "Pavement Design: Materials, Analysis and Highways", McGraw Hill, 1st Edition, 2020.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105107/
2. https://egyankosh.ac.in//handle/123456789/30916

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Derive knowledge on principles, types, components, functions of pavements & understand their stress and deflection characteristics. (K2)
2. Design flexible pavements by adopting various empirical and theoretical methods, specifications as per IRC guidelines. (K3)
3. Design rigid pavements by applying modified Westergaard's approach and IRC design standards & understand the scope of concrete roads in India. (K3)
4. Acquire knowledge on various equipment and methods of pavement construction, causes of distress and maintenance of pavements. (K2)
5. Interpret the concept of structural and functional evaluation of pavements based on various criteria and measurements. (K2)
6. Understand pavement stabilization techniques, testing and field control for highways and rural roads. (K2)

CO- PO, PSO MAPPING

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

PROFESSIONAL ELECTIVES - I

20CEEL504 SDG NO. 4,8,9 & 12	CONSTRUCTION PLANNING, SCHEDULING AND CONTROL	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study and understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.

UNIT I CONSTRUCTION PLANNING 6

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 12

Construction Schedules – Critical Path Method – Scheduling Calculations – Float – Presenting Project Schedules – Scheduling for Activity-on-Node and with Leads, Lags, and Windows – Scheduling with Resource Constraints and Precedence – Use of Advanced Scheduling Techniques – Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Tradeoffs – Improving the Scheduling Process.

UNIT III COST CONTROL, MONITORING AND ACCOUNTING 9

The Cost Control Problem – The Project Budget – Forecasting for Activity Cost Control – Financial Accounting Systems and Cost Accounts – Control of Project

Cash Flows –Schedule Control – Schedule and Budget Updates – Relating Cost and Schedule Information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and Safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical Methods – Statistical Quality Control with Sampling by Attributes – Statistical Quality Control with Sampling by Variables – Safety.

UNIT V ORGANIZATION AND USE OF INFORMATION 9

Types of Project Information – Accuracy and Use of Information – Computerized Organization and Use of Information – Organizing Information in Databases – Relational Model of Databases – Other Conceptual Models of Databases – Centralized Database Management Systems – Databases and Applications Programs – Information Transfer and Flow.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2. Srinath,L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

REFERENCES:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
2. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.
3. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.
4. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.
5. Construction Management And Planning by: sengupta, b. /guha, h. tata mcgraw-hill publications. 2011

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104161/
2. https://nptel.ac.in/courses/105/103/105103093/

OUTCOME:

Upon completion of the course, the student should be able to:

1. Describe the basic concepts of construction planning includes work task, choice of Technology, Precedence relationship, activity duration and resources estimation procedure(k2)
2. Formulate the construction activity time and float computations using CPM & PERT method(k3)
3. Assign the resource in the schedule and levelling it and calculate the cost estimation with optimum duration for a project using time cost trade off method(k3)
4. Determine the Forecast activity cost and control it and understand the various systems of accounts in a construction Project (k2)
5. Apply the knowledge of statistical quality control of materials using sampling methods and safety in construction projects. (k2)
6. Categorize the Project information in Centralized Database Management Systems and the various types of data involved.(k2)

CO - PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL505 SDG NO. 4, 9,11&15	GROUND IMPROVEMENT TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Students will be exposed to various problems associated with soil deposits and methods to evaluate them.
- The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 8

Role of ground improvement in Foundation Engineering –Methods Ground Improvement – Geotechnical Problems In Alluvial, lateritic and black cotton soils – Selection of Suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING 10

Dewatering Techniques- Well points–Vacuum and electro osmotic methods – Seepage analysis for two-dimensional flow for fully and partially penetrated slots in homogeneous deposits–Design for simple cases.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 10

In-situ densification of cohesionless soils-Dynamic compaction –Vibro - flotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils –Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime Piles - Installation techniques–Simple design –Relative merits of above methods and their limitations. Separation, road work sand containment applications.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material –Reinforced earth wall–Mechanism –Simple design –Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

UNIT V GROUTING TECHNIQUES **8**

Types Of Grouts–Grouting Equipment and Machinery–Injection Methods–Grout Monitoring Stabilization with cement, lime and chemicals–Stabilization of expansive soil.

TOTAL:45 PERIODS

TEXT BOOKS:

1. PurushothamaRaj. P, "Ground Improvement Techniques", Fire wall Media, 2005.
2. Bikash Chandra chatto padhyay and Jayanta Maity, "Ground Improv ement Techniques", PHI Learning Pvt. Ltd., 2017

REFERENCES:

1. Dr.B.C.Punmia" soil Mechanics and foundations"2017, Laxmi Public ations
2. Koerner, R.M. "Construction and Geo technical Methods in Foundation Engineering", Mc Graw Hill, 1994.
3. Moseley,M.P., "Ground Improvement Blackie Academic and Professional", Chapman and Hall,Glasgow,2004.
4. Winterkorn, H.F. and Fang, H.Y."Foundation Engineering Hand Book". Van Nostrand Reinhold,1994.
5. Koerner, R.M., "Designing with Geo synthetics" (Fourth Edition), Prentice Hall, Jersey, 2012.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105108075/
2. https://nptel.ac.in/courses/114/106/114106025/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Analyze the various ground improvement techniques in identifying different Geotechnical problems in soil. (K2)
2. Explain the dewatering techniques, Seepage analysis for 2D flows in homogeneous deposits and design for simple cases. (K2)
3. Elucidate in-situ densification and Consolidation of cohesion less soils, Stabilization of soft clay ground using stone columns and Lime piles by Installation techniques. (K2)
4. Understand the types of earth reinforcement material and its application in the principle of reinforced earth techniques like Geo textiles in filtration, drainage, separation, road works and containment appli cations (K2)
5. Explain about the types of grouts, grouting technique, equipments and machinery, grout monitoring. (K2)

6. Describe about the Stabilization of expansive soil and soft clay and its roles in foundation engineering. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL506 SDG NO. 4	CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

UNIT I CONSTITUENT MATERIALS 9

Cement - Different types - Chemical composition and Properties – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES 9

Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.

UNIT III PROPORTIONING OF CONCRETE MIX 9

Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Workability - Tests for workability of concrete - Segregation and Bleeding - Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.

UNIT V SPECIAL CONCRETES 9

Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.

REFERENCES:

1. Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi, 2015 Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995
2. Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
4. Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015
5. Kumar P Mehta., Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2016

ONLINE RESOURCES

1. https://www.onlinestudies.com/Courses/Building-Services/
2. https://www.mastersportal.com/studies/46963/building-services-engineering.html

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Explain the BIS Classification, Mechanical properties, grading requirements and tests in concrete (k2)
2. Illustrate the different chemical and their effect on concrete properties (k3)
3. Identify the Principles of Mix design related to the properties of concrete(k2)
4. Calculate the Design Mix and Nominal Mix according to BIS Method of Mix Design (k3)
5. Demonstrate the properties and Tests in fresh and hardened concrete(k3)
6. Describe the types,properties and strength paremeters of special concretes(k2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL507 SDG NO. 4	CONSTRUCTION MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge to the students on the management process, planning, scheduling and various contract laws related to construction and safety regulations.

UNIT I MANAGEMENT PROCESS 9

Management process- Roles, management theories, Social responsibilities. Planning and strategic management - strategy implementation. Decision making: tools and techniques – Organizational structure - Human resource management - motivation performance- leadership.

UNIT II PLANNING 9

Classification of Construction projects, Construction stages, Resources Functions of Construction Management and its Applications .Preliminary Planning- Collection of Data-Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT III SCHEDULING 9

Resource planning - planning for manpower, materials, costs, equipment. Labour, -Scheduling .Forms of scheduling - Resource allocation . budget and budgetary control methods

UNIT IV CONTRACT & TENDER 9

Contract - types of contract, contract document, specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration . negotiation - M.Book - Muster roll -stores.

UNIT V CONSTRUCTION LAWS & SAFETY REGULATIONS 9

Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction : legal and financial aspects of accidents in construction . occupational and safety hazard assessment. Human factors in safety . legal and financial aspects of accidents in construction . occupational and safety hazard assessment

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Ghalot, P.S., Dhir,D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2. Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co, Ltd., New Delhi, 1998.

REFERENCE:

1. Construction Management And Planning by: sengupta, b. /guha, h. tata mcgraw-hill publications.

2. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, new delhi,1987.
3. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
4. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.
5. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.

ONLINE RESOURCES

1. http://civilengineering-notes.weebly.com/water-supply-engineering.html
2. https://www.slideshare.net/arohthombre/drainage-system-for-a-building

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the management process such as planning , strategic management, Human resource management and decision making in construction Projects(K2)
2. Understand the classification, functions & stages of Construction Management and its Applications(K2)
3. Determine the Cost & Time optimization in construction management through Bar chart, Gant chart, CPM, and PERT (K3)
4. Derive the knowledge in Planning of resources & resource allocation with respect to budget & budgetary control methods (K2)
5. Interpret the concepts of different types of contracts and tender process of civil projects. (K2)
6. Acquire knowledge in types of laws, regulations and information systems in construction management (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL508 SDG NO. 4,9	WATERSHED MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide the technical, economical, and sociological understanding of a watershed.
- To provide a comprehensive discourse on the engineering practices of watershed management for realizing the higher benefits of watershed management

UNIT I WATERSHED CONCEPTS 9

Watershed - Need for an Integrated Approach - Influencing Factors: Geology – Soil – Morphological Characteristics - Toposheet - Delineation – Codification – Prioritization of Watershed – Indian Scenario

UNIT II SOIL CONSERVATION MEASURES 9

Types of Erosion – Water and Wind Erosion: Causes, Factors, Effects and Control – Soil Conservation Measures: Agronomical and Mechanical - Estimation of Soil Loss – Sedimentation

UNIT III WATER HARVESTING AND CONSERVATION 9

Water Harvesting Techniques – Micro-Catchments - Design of Small Water Harvesting Structures – Farm Ponds – Percolation Tanks – Yield from a Catchment

UNIT IV WATERSHED MANAGEMENT 9

Project Proposal Formulation - Watershed Development Plan – Entry Point

Activities – Estimation – Watershed Economics – Agroforestry – Grassland Management – Wasteland Management – Watershed Approach in Government Programmes –Developing Collaborative know how – People's Participation – Evaluation of Watershed Management

UNIT V GIS FOR WATERSHED MANAGEMENT 9

Applications of Remote Sensing and Geographical Information System - Role of Decision Support System – Conceptual Models and Case Studies

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Dhruva Narayana, G. Sastry, V. S. Patnaik, "Watershed Management", CSWCTRI, Dehradun, ICAR Publications, 1997
2. Lal, Ruttan. 2000. Integrated Watershed Management in the Global Ecosystem. CRC Press, New York.

REFERENCES:

1. Heathcote, I. W. Integrated Watershed Management: Principles and Practice. John Wiley and Sons, Inc., New York, 1988
2. Brooks, K. N., P. F. Ffolliott, H. M. Gregersen and L. F. DeBano.1997. Hydrology and the Management of Watersheds. Second Edition. Iowa State University Press.
3. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.
4. Chambers Robert, Managing canal irrigation, Cambridge University Press, 1989
5. Murthy, J.V.S., "Watershed Management in India", Wiley Eastern Ltd., New York, 1995.

ONLINE RESOURCES:

1. https://portal.ct.gov/DEEP/Water/Watershed-Management/Watershed-Management---Overview
2. https://nptel.ac.in/courses/105101010

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Explain the morphological Characteristics such as Toposheet, Delineation, and Codification & Prioritization of Watershed by knowing the influencing factors on watershed. (K2)
2. Calculate Soil loss due to erosion by Agronomical and Mechanical methods and to take conservation measures by knowing the types of soil erosion. (K3)

3. Apply small water harvesting Structures such as farm ponds, percolation tanks and to determine the yield from catchment. (K3)
4. Illustrate economical planning and estimation of watershed development project proposals through various entry point activities. (K3)
5. Describe agro-forestry development programmes on grassland management, wasteland management for watershed development in collaborative participation of government and public. (K2)
6. Explain the applications of remote Sensing and Geographical Information System &Decision Support System for water shed management through case studies. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL509 SDG NO. 4,9,11,15	ROCK MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on fundamentals of rock mechanics and its applications, solving simple problems associated with rock slopes and underground openings
- Students gain knowledge on the mechanics of rock and its applications in underground structures and rock slope stability analysis.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS 6

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose – Rock Mass Rating and System.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA 12

Modes Of Rock failure –Strength Of Rock– Laboratory Measurement Of Shear, tensile and compressive strength. Stress-strain behavior of rock under compression–Mohr-Coulomb failure criteria and empirical criteria.

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS 10

Estimation Initial stresses In Rocks– influence joints and their orientation distribution of stresses – measurements in-situ stresses – Hydraulic Fracturing – Flat jack method – Over coring method.

UNIT IV APPLICATION OF ROCK MECHANICS 10

Simple Engineering Application – Underground Openings – Rock Slopes – Foundation sand mining subsidence.

UNIT V ROCK STABILIZATION 7

Introduction – Rock support and Rock Reinforcement – Principles – Support reaction curves – Shotcreting.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. John A Hudson, John P Harrison., "Engineering Rock Mechanics: An Introduction to the Principles.", ELSEVIER Publishers Ltd.,UK,1995.
2. Xia-Ting Feng. " Rock Mechanics and Engineering". CRC Press,2017.

REFERENCES:

1. Steve Hencher. "Practical Rock Mechanics", CRC Press,2015.
2. B.H.G.Brady, E.T.Brown. "Rock Mechanics for Underground mining". (Third Edition) 2012.
3. John Conrad Jaeger, Neville G.W.Cook, Robert Zimmeman. "Fundamentals of Rock Mechanics". (Fourth Edition).1969.
4. John A hudson, "Engineering Rock Mechanics: An Introduction to the Principles" , Pearson publication, 2000
5. JP Harrison Engineering Rock Mechanics. An Introduction to the Principles" , Elsevier Science, 2002

ONLINE RESOURCES:

1. http://home.iitk.ac.in/~sarv/New%20Folder/Presentation-1.pdf
2. https://nptel.ac.in/courses/105106055/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Discuss different classification of rock systems and its rating system (K2)
2. Illustrate the Modes Of Rock failures under Stress-strain behaviour (K3)
3. Calculate the in-situ stresses of rock by influence joints and distribution of stresses (K3)
4. Apply the principle of Hydraulic Fracturing , Flat jack method , Over coring method for the calculation of in-situ stresses in rocks (K3)
5. Discuss Simple Engineering Application of rock mechanism satisfying mining subsidence (K2)
6. Describe the principles of Rock support and Rock Reinforcement (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - I

20CEEL510 SDG NO. 4,8,9,12	GROUNDWATER ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- The objective of this course is enable the student to understand the principles of Ground water governing Equations, Characteristics of different aquifers and techniques of groundwater model development and management.

UNIT I HYDROLOGICAL PARAMETERS 9

Introduction– Water bearing Properties of Rock–Type of aquifers-Aquifer properties– permeability, specific yield, transmissivity and storage coefficient–Methods of Estimation–GEC norms - Steady state flow - Darcy's

Law - Groundwater Velocity –- Dupuit Forchheimer assumption–Steady Radial Flow into a Well

UNIT II WELL HYDRAULICS 9

Unsteady State Flow-Theis Method - Jacobi Method – Chow's Method – Law of Times – Theis Recovery –Bailer Method–Slug Method-tests-Image Well Theory–Partial Penetrations Wells –Well losses–Specific Capacity and Safe yield – Collector well and Infiltration Gallery

UNIT III DISASTER MANAGEMENT 9

Need for Management Model–Database for Ground water Management – Ground water balance study – Introduction to Mathematical model – Model Conceptualization–Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

UNIT IV GROUNDWATER QUALITY 9

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water – Industrial Water – Irrigation water - Ground water Pollution and legislation – Environmental Regulatory requirements.

UNIT V GROUNDWATER CONSERVATION 9

Artificial recharge techniques – Reclaimed wastewater recharge –Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR)Seawater Intrusion and Remediation – Groundwater Basin management and Conjunctive Use – Protection zone delineation, Contamination source inventory and remediation schemes

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi,2010.
2. Todd D.K., "Ground Water Hydrology", JohnWiley and Sons, NewYork, 2000.

REFERENCES:

1. Fitts R Charles, "GroundwaterScience". Elsevier,Academic Press,2002.
2. Ramakrishnan, S,GroundWater,K.J. Grapharts, Chennai,1998.
3. Chahar BR, Ground water hydrology, McGraw Hill Education (India) Pvt Ltd, NewDelhi, 2015.
4. Rastogi A.K.,Numerical GroundwaterHydrology, 2011.
5. Mohammad Karamouz, Azadeh Ahmadi, Masih Akhbari, Groundwater "Hydrology Engineering, Planning, and Management ", CRC press, 2020

ONLINE RESOURCES:

1. https://www.ndl.gov.in/
2. https://www.classcentral.com/course/globalenvmanangement-4087

OUTCOMES:

On completion of the course, the student should be able to:

1. Describe the groundwater system basic, types of aquifers, aquifer parameters, movement and its potential for confined and unconfined aquifers (K2)
2. Apply the knowledge of groundwater flow in steady and unsteady flow Characteristics of well hydraulics (K3)
3. Explain the concept of ground water model development and database management for ground water management (K3)
4. Describe the importance of artificial recharge and groundwater quality concepts (K2)
5. Apply the creative and innovative technique on conservation of groundwater (K3)
6. Apply the principles of Mathematical models in Groundwater Engineering. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	2	3	0	1	3	3	3	3	2	1	1	3
CO2	1	3	0	3	0	0	3	2	3	3	2	1	1	3
CO3	1	3	0	3	0	0	3	2	3	3	2	1	1	3
CO4	1	3	0	3	0	0	3	2	3	3	2	1	1	3
CO5	1	3	0	3	0	0	3	2	3	3	2	1	1	3
CO6	1	3	0	3	1	2	2	2	3	3	2	1	1	3

PROFESSIONAL ELECTIVES - II

20CEEL601 SDG NO. : 4 & 9	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students conversant with the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

UNIT I SOURCES AND CHARACTERISTICS 8

Sources and types of municipal solid wastes - waste generation rates - factors affecting generation, characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - Public health and environmental effects. Elements of solid waste management – Social and Financial aspects – l solid waste (M&H) rules – integrated solid waste management.

UNIT II ON-SITE STORAGE AND PROCESSING 8

On-site storage methods – Effect of storage, materials used for containers–segregation of solid wastes–Public health and environmental aspects of open storage – waste segregation and storage–case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling of plastic waste – Construction and Demolishing waste.

UNIT III COLLECTION AND TRANSFER 8

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems-solving.

UNIT IV OFF-SITE PROCESSING 12

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and bio methanation; Thermal processing options–case Studies under Indian conditions

UNIT V DISPOSAL 9

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills–Landfillliners –Management of leachate and land fill gas - Land fill bioreactor – Dump site capping–Biomining

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Cherry PM, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018
2. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management Science and Engineering, Butterworth -Heinemann, 2016

REFERENCES:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid WasteManagement,Mc-GrawHill India, First edition, 2015.
2. William A. Worrell, P. Aarne Vesilind, Christian Ludwig, Solid Waste Engineering - A Global Perspective, 3rdEdition, Cengage Learning, 2017.
3. Michael D.LaGrega, PhilipL Buckingham, Jeffrey C. E vans and "Enviro nmental Resources Management, Hazardous waste Management", Mc Graw Hill International edition, New York, 2010.
4. John Pitchtel, Waste Management Practices, CRC Press, Taylor and Francis Group, 2014.
5. Gary C.Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/120/108/120108005/
2. https://nptel.ac.in/courses/120108005/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand sources, types,characteristics, factors affecting waste generationin rates and sampling methods of Municipal solid waste management system(K2)
2. Illustrate the effects of improper solid waste disposal methods,its impacts on Environment and Society, Municipal solid waste management handling rules 2000 and the concept of Integrated Solid Waste Management System(K2)
3. Explain the various storage methods, segregation of solid waste, public health and environmental impacts of open storage, 3R's principles, Recycling of plastic waste and Case studies under Indian conditions. (K3)
4. Elaborate the methods of Municipal solid waste collection, Collection vehicles, Collection routes, Maintenance and Operation of Transfer Stations. (K3)

5. Apply the physical processing techniques with suitable equipment for the recovery of resources by Composting, Biomethanation, Thermal processing options and Case studies. (K3)
6. Design of Sanitary Land Fill sites,Land Fill bio reactor,Management of Leachate and Landfill Gas.(K3)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - II

20CEEL602 SDG NO. 4	DESIGN OF PLATE AND SHELL STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the design of plate and shell and spatial structures

UNIT I THIN PLATES WITH SMALL DEFLECTION 10

Laterally loaded thin plates – Governing differential equation, various boundary conditions.

UNIT II RECTANGULAR PLATES 10

Simply supported rectangular plates- Navier solution and Levy's method – Loading.

UNIT III ANALYSIS OF THIN SHELLS **5**

Shells of revolution – Spherical dome, conical shell and ellipsoid of revolution – Shells of translation–Cylindrical shell and hyperbolic parabolic – Classification of shells- Types of shells - Structural action.

UNIT IV DESIGN OF SHELLS **10**

Spherical dome, conical shell and Cylindrical shell.

UNIT V SPACE FRAMES **10**

Space Frames – Configuration – Node connector – Types –General principles of design philosophy – Behaviour.

TOTAL: 45 PERIODS

TEXTBOOKS:

1 P. C. Varghese, Design of Reinforced Concrete Shells and Folded Plates, PHI Learning Private Limited, New Delhi, 2010.
2. R. Szilard, Theory and Analysis of Plates, Prentice Hall Inc., 1995.

REFERENCES:

1. Billington D.P.Thin Shell Concrete Structures, McGrawHill, 1995.
2. Chatterjee B.K.Theory and design of Concrete Shells, Oxford and IBH Publishing Co., NewDelhi 1998.
3. N.Subramanian, Principles of Space Structures, Wheeler Publishing Co.1999.
4. Maan Jawad, Theory and Design of Plate and Shell Structures, 1994.
5. Maria Radwanska, Anna Stankiewicz, Adam Wosatko and Jerzy Pamin, "Plat and Shell Structures", Wiley Publications, 2000.

WEB REFERENCES:

1. http://www-g.eng.cam.ac.uk/csml/teaching/4d9/4D9_handout1.pdf
2. https://ndl.iitkgp.ac.in/

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-081j-plates-and-shells-spring-2007/

OUTCOMES :

Upon completion of the course, the student should be able to

1. Solve Laterally loaded thin plates under different types of loads(k3).
2. Analyze thin plates using Navier's method and Levy's method(k4)

3. Apply the concept of thin shells revolution in Spherical , conical and cylindrical shells(k3)
4. Classify different types of thin shells and its Structural action(k2)
5. Illustrate different types of shells,domes and study their behavior(k2)
6. Apply the general principle and design philosophy of space frame behaviour (k3)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL603 SDG NO. 4,9	PREFABRICATED STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the principles of prefabrication, behavior and design of prefabricated components and structural connections.

UNIT I INTRODUCTION **10**

Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection - Disuniting of Structures.

UNIT II PREFABRICATED COMPONENTS **10**

Behavior of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.

UNIT III DESIGN PRINCIPLES **10**

Design of Structural components – Beam, Column and Corbel - Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces.

UNIT IV JOINTS IN STRUCTURAL MEMBERS 8

Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints- Jointing Materials.

UNIT V DESIGN FOR EARTHQUAKES AND CYCLONES 7

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Hubert Bachmann and Alfred Steinle , Precast Concrete Structures, 2012.
2. Laszlo Mokk, Prefabricated Concrete for Industrial and Public Structures, Akademiai Kiado, Budapes1964.

REFERENCES:

1. PCI Design Hand Book, 6th Edition, 2004.
2. Handbook on Precast Concrete for Buildings, ICI Bulletin 02, First Edition, 2016.
3. Bruggeling A.S.G. and Huyghe G.F., Prefabrication with concrete, Netherlands: A.A. Balkema Publishers, 1991.
4. Glover C.W, Structural Precast Concrete, Asia Publishing House, 1965.
5. Ganesan. R and Latha. A Prefabricated Structures, kalamani publications,2014

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105102088/
2. https://onlinecourses.nptel.ac.in/noc20_ar04/preview

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Describe the principles of modular co-ordination, Systems Production, Transportation and erection of structures(K2)
2. Explain the behaviour of different types of structural components used for construction (K2)
3. Calculate different types of stresses developed in Beam, Column and Corbel satisfying stripping forces.(K3)
4. Illustrate different types of connections of joints in structural elements(K3)

5. Calculate different types of streeses developed in expansion joints satisfying the design parameters of joint materials(K2)
6. Identify the Codal provisions for Equivalent design loads considering the abnormal effects such as Earthquakes, cyclones(K2)

CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL604 SDG NO. 4	BRIDGE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the student know about various bridge structures, selection of appropriate bridge structures and its design for given site conditions.

UNIT I INTRODUCTION **9**

History of bridges - Components of a bridge - Classification of road bridges - Selection of site and initial decision process - Survey and alignment; Geotechnical investigations and interpretations. River Bridge: Selection of Bridge site and planning - Collection of bridge design data - Hydrological calculation Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate and indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations - Railroad vs. Highwaybridges.

UNIT II SUPER STRUCTURES 9

Bridge decks – Structural forms and behavior – Choices of superstructure types – Behavior and modeling of bridge decks – Simple beam model – Plate model – Grillage method – Finite Element method - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge - Temperature Analysis - Distortional Analysis - Effects of Differential settlement of supports - Reinforced earth structures

UNIT III SUBSTRUCTURE, BEARINGS AND EXPANSION JOINTS, PARAPETS AND RAILINGS 9

Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge- Continuous Bridge - Bearings and Expansion Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges

UNIT IV DESIGN OF RCC AND PSC BRIDGES 9

Design of slab bridges – T beam bridges – PSC bridges

UNIT V DESIGN OF STEEL BRIDGES 9

Design of Truss Bridges – Design of Plate girder bridges.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi,2009.
2. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd.,2013

REFERENCES:

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi,1990.
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi,1996.
3. Rajagopalan. N. "Bridge Superstructure", Alpha Science Interna tional,2006
4. Raina V.K." Concrete Bridge Practice" Tata McGraw Hill Publishing Company, New Delhi, 1991
5. Chajes, A. "Principles of Structures Stability Theory", Prentice Hall, 1974.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105165/
2. https://www.edx.org/course/the-art-of-structural-engineering-bridges

OUTCOMES:

On successful completion of this course, students will be able to:

1. Describe transverse distribution of loading on bridges in working state and limit state designs(k2)
2. Construct the different types of behavior and modeling of bridge decks(k3)
3. Apply the principles of Finite Element method for RCC and PSC bridges satisfying the effects of Differential settlement of supports(k3)
4. Discuss different types of foundations used for the construction of Highway Bridges(k2)
5. Analyze the behavior of slab ,T beam and PSC bridges (k4)
6. Analyze the Behavior of Truss and Plate girder Bridges (k4)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL605 SDG NO. 4,9,11,15	SOIL DYNAMICS AND MACHINE FOUNDATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of dynamics and dynamic behavior of soils
- Effects of dynamic loads and the various design methods.

UNIT I THEORY OF VIBRATION **9**

Nature dynamic loads –Vibrations of single degree freedom system– Free vibrations of spring– mass systems–Forced vibrations–Viscous damping-Transmissibility –Principles of vibration measuring instruments–Effect of Transient and Pulsating loads

UNIT II WAVE PROPAGATION **9**

Elastic waves in rods of infinite length–Longitudinal and Torsional –Effect of end conditions– Longitudinal and torsional vibrations of rods of finite length–Wave Propagation in infinite, homogeneous isotropic and elastic medium-Wave propagation in elastic half space–Typical values of compression wave and shear wave velocity– Wave propagation due to Machine foundation–Surface wave–Typical values –Particle movements and velocity.

UNIT III DYNAMIC PROPERTIES OF SOILS **9**

Dynamic stress – Strain characteristics – Principles of measuring dynamic properties–Laboratory Techniques–Field tests–Factors affecting dynamic properties–Typical values–Dynamic bearing capacity–Dynamic earth pressure.

UNIT IV FOUNDATION FOR DIFFERENT TYPES OF MACHINES **9**

Types of machines and foundation– General requirements–Modes of vibration of a rigid foundation – Method of analysis – Linear elastic weight less spring method – Elastic half space method–Analog Method–Design of block foundation–Special consideration for rotary, Impact type of machines–Codal Provisions.

UNIT V INFLUENCE OF VIBRATION AND RE MEDIATION **9**

Mechanism of Liquefaction– Influencing factors –Evaluation of Liquefaction potential based on SPT-Force Isolation–Motion Isolation–Use of spring and damping materials–Vibration control of existing machine

foundation–Screening of vibration–Open trenches –Pile Barriers–Salient construction aspects of machine Foundations.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Swami saran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd. (Second Edition) 2006, (Reprint 2010), New Delhi-110002
2. Srinivasulu. P, and Vaidyanathan. C. V, "Handbook of Machine Foundations", Tata Mc Graw Hill,2007.

REFERENCES:

1. Kameswara Rao.,"Vibration Analysis and Foundation Dynamics", Wheeler Publishing, NewDelhi,1998.
2. Kameswara Rao.,"Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003.
3. Moore, P.J., "Analysis and Design of Foundation for Vibration", Oxfordand IBH, 2005
4. Steven L. Kramer, "Geo technical Earthquake Engineering", Prentice Hall, 2014.
5. IS Code 5249: 1992 (Reaffirmed 2006) Determination of Dynamic Properties of Soil -Method of Test Bureau of Indian Standards, New Delhi.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105101005/
2. https://www.slideshare.net/LATIFHYDERWadho/soil-dynamics

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Discuss the principles and effect of vibration of natural dynamic loads(K2)
2. Illustrate elastic waves in rods of infinite length and Wave propagation due to Machine foundation(K3)
3. Describe the principle of dynamic earth pressure in Laboratory Techniques (K2)
4. Illustrate different types of machine foundations (K3)
5. Apply different methods of impact analysis of machine foundations (K3)
6. Classify different mechanism of machine foundations satisfying vibration control and its salient construction(K2)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL606 SDG NO. 4	ADVANCED SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the use of Astronomy, Photogrammetry, Total Station and GPS

UNIT I ASTRONOMICAL SURVEYING 9

Astronomical terms and definition – Motion of sun and stars – Celestial co-ordinate System - Time system - Nautical Alamance – Apparent attitude and corrections – Field observations and determinations of time, longitude, latitude and azimuth by attitude and Hour angle method.

UNIT II AERIAL SURVEYING 9

Terrestrial Photogrammetry – Terrestrial stereo photogrammetry – Aerial photogrammetry – overlaps – scale of photographs – Vertical and titled photographs distortion in aerial photographs – stereostopic vision - photo interpretation – Applications.

UNIT III TOTAL STATION SURVEYING 9

Classification – basic measuring and working principles of an Electro – optical

and Microwave total station- sources of errors in Electro – optical and Microwave total station – Care and Maintenance of total station – trilateration – Applications.

UNIT IV GPS SURVEYING **9**

Basic concepts – Space, Control and User segments – Satellite configuration – Signal structure – Orbit determination and representation – Antispoofing and selective availability – hand held and geodetic receivers – Field work procedure – Data processing Applications.

UNIT V MISCELLANEOUS SURVEYS **9**

Reconnaissance – Rout surveys for highways, railways and waterways – simple, compound, reverse , transition and vertical curve – setting out methods - hydrographic surveying – tides – MSL – Sounding methods – measurement of current and discharge – Tunnel alignment and setting out – Settlement and Deformation studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. James M.Anderson and Edward M.Mikhail, " Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.
2. Bannister and S.Raymond, "Surveying", 7th Edition, Longman 2004.

REFERENCES:

1. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
2. Arora K.R. "Surveying Vol I & II", Standard Book House, 10th Edition 2008.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer – Verlag, Berlin, 2003.
4. Seeber G, Satellite Geodesy, Water De Gruyter, Berlin,1998.
5. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.

ONLINE RESOURCES:

1. http://civilengineering-notes.weebly.com/water-supply-engineering.html
2. https://www.slideshare.net/arohthombre/drainage-system-for-a-building

OUTCOMES:

Upon completion of the course student will be able to:

1. Understand the basic concept like terms, co- ordinate systems, time systems and Motion of Sun & Star in astronomical surveying(K2)
2. Determine the indirect measurement like azimuth, altitude & hour angle and adjusting the errors occurred in field work using various methods in astronomical surveying(K3)
3. Acquire the knowledge in various types photogrammetry survey and its application in Aerial Surveying(K2)
4. Apply the principles & working procedure of total station surveying in the field work and its application in Trilateration (K2)
5. Interpret the basic concepts and field working procedure of GPS surveying(K2)
6. Derive the knowledge in route surveying, hydrographic surveying and basic concepts of curves & their setting out methods.(K3)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL607 SDG NO. 4,9,11	GEOINFORMATICS APPLICATIONS FOR CIVIL ENGINEERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To solve the Civil Engineering problems with the help of Geoinformatics technique.

UNIT I LAND RESOURCE MANAGEMENT 8

Total Station and GPS Surveys – Topographic and Bathymetric Surveys – Cadastral Information – Soil and Land Use Surveys - Land Information System (LIS) – Real Estate Information System

UNIT II STRUCTURAL STUDIES 8

Deformation studies of deflection - Dam deformation - Structural movement - Pavement yield - Shifting sand-bank and shoreline – Landslide Risk Analysis.

UNIT III SOIL CONSERVATION AND MANAGEMENT 9

Soil survey interpretation and mapping - Impact of agricultural and industrial activity on soil properties - Soil erosion - Factors influencing soil erosion - Soil contamination using Hyper spectral Remote Sensing - Mining pollution- EMR responses with contaminated soil - Modeling soil characteristics using satellite data - Soil degradation assessment using Remote Sensing and GIS - Land reclamation studies.

UNIT IV URBAN AND TRANSPORTATION MANAGEMENT 10

Monitoring Urban growth through Remote Sensing - Geo-demographic Analysis – Property Market Analysis Urban Renewal - Traffic analysis - Accident analysis - Site suitability analysis for transport infrastructure – Transportation databases: creation and maintenance - Vehicle routing – Highway maintenance system – Intelligent Transportation System.

UNIT V WATER RESOURCES PLANNING AND MANAGEMENT 10

Location of storage/diversion works – Capacity curve generation – sediment yield - Modelling of catchments – Delineation of watershed - Watershed modelling for sustainable development - Rainfall – Runoff modelling – LiDAR Mapping for Urban area – Water quality mapping and monitoring – Flood Risk Zoning - Flood damage assessment – Flood Modelling - Assessment of droughts and mitigation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Basudeb Bhatta, "Remote Sensing and GIS", 2nd edition, Oxford University Press, 2011.
2. Lo.C.P., Albert K.W.Yeung, "Concepts and Techniques of Geographic Information Systems", Second edition, PHI Learning Private Limited, Delhi, 2014.

REFERENCES:

1. Andrew N. Rencz, "Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring", John Wiley & Sons Inc, April 2004
2. Rashed, Tarek; Jürgens, Carsten (Eds.), "Remote Sensing of Urban and Suburban Areas", Springer, 1st Edition. 2010.
3. Harvey J. Miller, Shih-Lung Shaw, "Geographic Information Systems for Transportation – Principles and Applications", Oxford University Press, 2001.
4. Gert A. Schulitz Edwin T. Engman, "Remote Sensing in hydrology and Water Management", Springer - verlag Berlin Heidelberg Germany - 2000.
5. Jayanta Kumar Ghosh, Irineu da Silva, "Applications of Geomatics in Civil Engineering" 2018,LNCE, volume 33

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/107/105107155/
2. http://www.gisresources.com/resource-box/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand geo informatics techniques, modern equipment, surveys & their applications in Land resource management and information systems. (K2)
2. Acquire knowledge on structural deformation and movement, shoreline shifting & landslide risk analysis using GIS. (K2)
3. Apply remote sensing and GIS techniques to study and model Soil characteristics, erosion, contamination, degradation, conservation and management. (K2)
4. Analyze and manage urban development and transportation infras tructure using remote sensing and GIS. (K2)
5. Locate diversion works, model catchments and watershed for sustainable development using GIS. (K2)
6. Assess, map and model water quality, floods and droughts by applying geoinformatics techniques. (K2)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL608 SDG NO. 4,9	PARTICIPATORY WATER RESOURCES MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain an insight on local and global perceptions and approaches on participatory water resource management.

UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH **9**

Sociology – Basic concepts – Perspectives – Social Stratification – Irrigation as a Socio technical Process – Participatory concepts– Objectives of participatory approach

UNIT II UNDERSTANDING FARMERS PARTICIPATION **9**

Farmers participation – need and benefits – Comparisons of cost and benefit – Sustained system performance – Kinds of participation – Context of participation, factors in the environment – WUA – Constraints in organizing FA – Role of Community Organiser – Case Studies

UNIT III ISSUES IN WATER MANAGEMENT **9**

Multiple use of water – Issues in Inter– sectoral Water Allocation – domestic, irrigation, industrial sectors – modernization techniques – Rehabilitation – Command Area development – Water delivery systems.

UNIT IV PARTICIPATORY WATER CONSERVATION 9

Global Challenges – Social – Economic – Environmental – Solutions – Political – Water Marketing – Water Rights – Consumer education – Success Stories Case Studies

UNIT IV PARTICIPATORY WATERSHED DEVELOPMENT 9

Concept and significance of watershed – Basic factors influencing watershed development – Principles of watershed management – Definition of watershed management – Identification of problems – Watershed approach in Government programmes – People's participation – Entry point activities – Evaluation of watershed management measures.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Wurbs R.A., and James W.P. Water Resources Engineering. Prentice Hall of India, Eastern Economic Edition. ISBN: 81-203-2151-0, New Delhi, 2007
2. Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. 2003.

REFERENCES:

1. Technical Advisory Committee, Integrated Water Resources mana gement, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002.
2. Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper no: 8. Global water partnership, Stockholm, Sweden, 2003.
3. Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background paper No:1. Global water partnership, Stockholm, Sweden, 1998.
4. Mollinga, P. etal"Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006
5. Narayanamoorthy, A. Participatory irrigation management: Evolution, perception, and impact. New Delhi: Gyan Pub. House, 2011.

ONLINE RESOURCES:

1. https://elibrary.worldbank.org/doi/abs/10.1596/0-8213-4540-0
2. https://swayam.gov.in/nd2_nou20_ag05/preview

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Discuss basic concepts in participatory approach for social stratification and irrigation. (K2)
2. Describe Sustained system performance and its factors in the environment. (K2)
3. Summarize different Water delivery systems for rehabilitation with modern techniques. (K2)
4. Describe Global Challenges, Social, Economic, Environmental and political Solutions in water marketing. (K2)
5. Explain Concept and significance of watershed management (K2)
6. Discuss and identify the problems in Watershed approaches. (K2)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20CEEL609 SDG NO.4,7,12	POWER PLANT STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To deal with the study of energy, its sources and utilization of energy for power generation
- To introduce students to different aspects of power plant engineering.
- To familiarize the students to the working of power plants based on different fuels
- To expose the students to the principles of safety and environmental issues.
- Basic knowledge of different types of non-conventional energy sources

UNIT I FUNDAMENTALS OF POWER PLANTS 9

Introduction – Classification of Power Plants – Principles of Power Plant – Lay out of Power Plant Building – Selection of type of generation – Resources for power generation – Machine foundation.

UNIT II HYDRO ELECTRIC POWER PLANTS 9

Elements of hydro-electric power plants – Advantages and disadvantages of water power - General and essential elements of Hydro electric Power Plant – Structural requirements – Selection of site for hydroelectric plant – Penstocks and surge Tanks in Power Station.

UNIT III THERMAL POWER PLANTS 9

Planning, Analysis of thermal power plants – Layout – Ash handling – Dust collection – Induced draught and natural cooling towers – Air/water pollution by thermal power plants.

UNIT IV NUCLEAR POWER PLANTS 9

General characteristics of Nuclear Power Plants – Classification of reactors – Pressurized Water Reactor, Boiling Water Reactor, Fusion Power Reactor, Heavy Water Reactor - Selection criteria of materials for different systems – Containment structures – Nuclear power plant safety measures–Safety systems and support systems

UNIT V NON CONVENTIONAL POWER PLANTS 9

Types – Wind power plants – Selection of wind mill – Tidal power plants – Solar thermal power plants – Geothermal power plants – Principles and essential features.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Sharma S.C. and Nagpal G.R., Power Plant Engineering, Khanna Publishers, 2013.
2. Raja A.K, Amit Prakash Srivastava and Manish Dwivedi, Power Plant Engineering.

REFERENCES:

1. R.K Rajput, Power Plant Engineering, Fifth Edition, 2016.
2. P.C Sharma, power Plant Engineering, S.K. Kataria & Sons; 2013.
3. Wei Tong, Wind Power Generation and Wind Turbine Design, WIT Press / Computational Mechanics, First edition, 2010.

4. Dipak k Sarkar, Thermal Power plant: Design and Operation, Elsevier Publisher 2015.
5. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112107291/
2. https://swayam.gov.in/nd1_noc20_me10/preview

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Explain the principles, layout and functional aspects of a power plant structure(k2)
2. Illustrating the selection and resources of power generation
3. Summarize the layout and components of hydroelectric powerplant(k2)
4. Discuss the planning and analysis of Thermal power plant(k2)
5. Illustrate different types of reactors in nuclear power plants (k3)
6. Choose the type of wind mills fulfilling the need of tidal ,solar and geothermal features (k3)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

20MGEL601 SDG NO.4,8,9,12	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts and philosophies of Quality Management
- To know the impact and siginificance of TQM principles on organizations in recent times.

UNIT 1 INTRODUCTION **8**

Need and Evolution of Quality, Quality-Definitions, statements and dimensions of product and service quality TQM-concepts, Elements and Framework, Benefits & Obstacles of TQM , TQM-Culture, Stategic Quality Management, Costs of Quality.

UNIT II CONTRIBUTIONS AND APPROACHES TO QUALITY MANAGEMENT **9**

Renowned quality gurus- Deming, Juran, Crosby and Ishikawa, Contributions of Taguchi – Loss Function, Signal to Noise Ratio and design of experiments, Kaizen -principles and practices-5 S tools, Poka Yoke-8Discipline Methodology, Just in time, Continous process improvement-PDCA cycle and 5 why analysis

UNIT III CUSTOMER FOCUS AND TEAMWORK **8**

Identifying Customer Needs, QFD - Process, Building HoQ, Customer Satisfaction Measurement Techniques. Employee Involvement Practices. Individual Participation - Suggestion Systems & Empowerment, Motivation,Leadership, Partnerships - Cross-Functional Teams, Supplier/Customer Partnerships, Problem -Solving Teams - Quality Circles.

UNIT IV STATISTICAL TOOLS & TECHNIQUES **11**

SQC - Tools For Data Collection And Analysis – Seven tools(old and new),Statistical Process Control (SPC) – Construction of Control Chart – Variables and Attributes. Process Capability – concepts and measurement. Six Sigma models ,Lean six sigma, BPR, TPM, FMEA and Benchmarking.

UNIT V QUALITY SYSTEMS AND STANDARDS **9**

Need for ISO 9000- ISO 9001: 2015 quality system-guidelines and clausewise requirements,Quality audits-types and responsibilities,ISO 14001:2004 EMS,

ISO / TS 16949:2002, ISO 27001:2005 ISMS, SEI – CMMIand Awards - Demings Prize, MBNQA and criteria.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Besterfield, Total Quality Management, 3rd Edition, Pearson India
2. Shridhara K Bhat, Total Quality Management. Himalaya Publishing House, 2010.

REFERENCE BOOKS

1. Bedi Kanishka, Quality Management, Oxford University Press
2. Kiran D.R., Total Quality Management - Key Concepts and Case Studies, Butterworth-Heinemann, 2016.
3. Poornima M Charantimath, Total Quality Management. Pearson India, 2017
4. Sharma DD, Total Quality Management, Principles, Practice and Cases, Sultan Chand and Sons.
5. Douglas C. Montgomory, Introduction to Statistical Quality Control, Wiley Student Edition, 4 th Edition, Wiley India Pvt Limited, 2008

MOOC References

1. https://www.coursera.org/lecture/supply-chain-management/total-quality-management-wLrvy
2. https://swayam.gov.in/nd1_noc20_mg34/preview
3. https://www.openlearning.com/courses/total-quality-management/
4. https://www.udemy.com/course/tqm-in-academics/

ONLINE RESOURCES

1. https://www.unido.org/sites/default/files/2009-04/A_roadmap_to_quality_volume_1_0.pdf
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://www.researchgate.net/publication/237006071_Total_Quality_Management_in_Academic_Libraries_A_Study
4. https://www.isixsigma.com/methodology/total-quality-management-tqm/introduction-and-implementation-total-quality-management-tqm/
5. https://study.com/academy/lesson/five-principles-of-total-quality-management-tqm.html

OUTCOME:

Upon completion of the course, the student should be able to

1. Understand quality concepts and philosophies of TQM. (K2)
2. Apply TQM principles and concepts of continuous improvement. (K3)
3. Explain the quality tools, management tools and statistical fundamentals to improve quality. (K2)
4. Demonstrate the various TQM tools as a means to improve quality. (K2)
5. Illustrate quality tools and procedures for better quality output. (K3)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - III

20CEEL701 SDG NO. : 4, 14&15	INDUSTRIAL WASTEWATER TREATMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge on sources and characteristics of Industrial Waste Waters
- Understand the techniques and approaches for minimizing the generation of waste waters at the source
- To describe the application of physico-chemical, biological and advanced treatment methods for recovery, reuse
- Understand the disposal of waste waters in Indian Industries

UNIT I INDUSTRIAL POLLUTION PREVENTION 8

Industrial scenario in India–Usesofwaterby Industry–sourcesgeneration rates and characteristics of Industrial waste waters – Toxicity of Industrial Effluents and Bioassay Tests – Environmental Impacts of Industrial Waste waters – Regulatory requirements for Industrial waste waters-Prevention Vs Control of Industrial Pollution–Benefits and Barriers– Waste Minimization Strategies – Evaluation of Pollution Prevention Options–Costbenefit analysis–Payback period.

UNIT II INDUSTRIAL WASTE WATER TREATMENT 9

Physico–Chemical Treatment Processes– Equalisation, Neutralisation, Oil Seperation, Flotation– Precipitation, Aerobic and Anaerobic Biological Treatment Processes – Sequencing batch reactors, membrane bioreactors, Advanced oxidation and Tertiary Treatment processes for removal of dissolved organics and inorganics-Ozonation, photo catalysis, Evaporation and membrane Technologies

UNIT III ZERO LIQUID DISCHARGE 9

Individual and Common Effluent Treatment Plants–Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse–Industrial reuse, Disposal on water and land.

UNIT IV SLUDGE AND HAZARDOUS WASTE MANAGEMENT 9

Residuals of Industrial Waste water treatment– Qualification and Characteristics of Sludge Thickening, Digestion, Conditioning, Dewatering and Disposal of Sludge–Solidification – Incineration–SecuredLandfills-Hazardouswaste management.

UNIT V CASE STUDIES **10**

Industrial manufacturing process description, Wastewater characteristics, Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries-Textiles-PulpandPaper- Metal finishing – Sugar and Distilleries.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.C.Bhatia, "Hand book of Industrial Pollution and Control", Volume I &II, CBS Publishers, New Delhi, 2003.
2. Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw Hill PublishingCo, New Delhi , 1991

REFERENCES

1. Eckenfelder, W.W., "Industrial Water Pollution Control" ,Mc-Graw Hill, 2000
2. Nelson Leonard Nemerow, "Industrial waste treatment – contemporary practice and vision for the future", Elsevier, Singapore,2007
3. Frank Woodard, Industrial waste treatment Handbook", Butter worth Heinemann, New Delhi, 2001.
4. World Bank Group, "Pollution Prevention and Abatemen Handbook – Towards Cleaner Production" ,World Bank and UNEP, Washington D.C., 1998
5. Paul L.Bishop," Pollution Prevention:- Fundamentals and Practice" , Mc-Graw Hill International, Boston, 2000

ONLINE RESOURCES:

1. https://online-learning.tudelft.nl/courses/high-rate-anaerobic wastewater-treatment
2. https://www.slideshare.net/mohamedramzy2013/industrial wastewater-treatment

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the source and types of industrial waste water and their environmental impacts and choose the regulatory laws pertaining to environmental protection. (K2)
2. Apply the physio-chemical treatment Processes for industrial wastewater treatment schemes (K3)

3. Describe the biological treatment technologies for removal of dissolved organics and inorganics matters (K2)
4. Depict the facilities for the processing and reclamation of industrial wastewater(K2)
5. Discuss sludge management scheme for sludge generated from Industries.(K2)
6. Construct on effective management systems for industrial waste water that are technically sound, economically feasible and socially acceptable.(K3)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL702 SDG NO.4,9&11	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the behavior of structures under dynamic Loading
- To understand the behavior of structures earthquake loading
- Design the structures as earthquake resistant as per codal provisions.

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9

Definition of degree of freedom Idealization of structure as Single Degree of Freedom (SDOF) system–Formulation of equation of motion for various SDOF system–D'Alemberts Principles-Effect of damping–Free and forced vibration of damped and undamped structures– Response to harmonic forces and periodic loading.

UNIT II MULTIDEGREE OF FREEDOM SYSTEM 9

Formulation of equation of motion for multidegree of freedom (MDOF) system–Evaluation of natural frequencies and modes–Eigen values and Eigenvectors–Orthogonality and normality principles–Response to free and forced vibration of undamped and damped MDOF systems– Modal super position methods

UNIT III INTRODUCTION TO EARTH QUAKE ENGINEERING 9

Elements of Engineering Seismology –Definitions, Introduction to Seismichazard, Earthquake phenomenon –Seismotectonics–Seismic Instrumentation–Characteristics of Strong Earthquake motion– Estimation of Earthquake Parameters – Soil Structure Interaction.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9

Effect of earth quake on different types of structures –Behaviour of RCC, Steel and prestressed Concrete Structures under earth quake loading– Pinching Effect–Bouchinger Effects – Liquefaction of soil– Response Spectra – Causes of damage–Lessons learnt from past earthquakes.

UNIT V CONCEPTS OF EARTH QUAKE RESISTANT DESIGN 9

Planning considerations and Architectural concepts –Evaluation of Earth quake forces–Lateral load analysis –Guidelines for Earthquake resistant design–Earth quake resistant design of masonry and RCC buildings – Design considerations –Guidelines–Design and detailing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. MarioPaz, "Structural Dynamic Theory and Computations", Fifth Edition 2nd printing, CBS publishers, 2006.
2. Agarwal.P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt.Ltd., 2011.

REFERENCES:

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw HillInternational Edition,1995
2. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company,1986
3. Anil KChopra, Dynamics of structures– Theory and applications to Earthquake Engineering, Prentice Hall Inc.,2007.
4. Er. Srinavas Vasam, Dr. K. Jagannadha Rao- Structural Dynamics & Earthquake Engineering, S.K. Kataria & Sons, 2019

5. Mario Paz, Structural Dynamics -Theory and Computation, Kluwer Academic Publishers, 2004.

ONLINE RESOURCES:

1. https://free video lectures.com/course/3129/structural-dynamics
2. https://www.classcentral.com/course/swayam-structural-dynamics-for-civil-engineers-sdof-systems-14311

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the concept of science and engineering fundamentals to idealize and formulate the equations of motion for SDOF system(K3)
2. Describe the equations of motion for MDOF system and to evaluate the natural frequencies and mode shapes(K2)
3. Explain the elements of engineering seismology, characteristics of earthquake and seismic instrumentation(K2)
4. Identify the various causes and effects of earthquakes on structures due to past earthquakes(K2)
5. Describe ethe behaviour of RCC, steel, prestressed Concrete Structures under earthquake loading(K2)
6. Analyze the structures subjected to dynamic loading and to design for Seismic loading as per codal provisions(K 4).

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Co1	3	3	-	-	-	-	-	-	3	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	-	2	2	-	-	2	2	2	-	-	-	-	3
CO5	3	-	3	3	2	3	2	2	2	1	1	1	1	3
CO6	3	-	3	3	2	3	2	2	2	1	1	1	1	3

PROFESSIONAL ELECTIVES - III

20CEEL703 SDG NO. 4 & 9	INDUSTRIAL STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain knowledge about analyze, design and detailing of industrial structures

UNIT I PLANNING **9**

Classification of industries and industrial structures – General requirements of various industries – Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation - Acoustics – Fire safety – Guidelines from factories act.

UNIT III DESIGN OF STEEL STRUCTURES **9**

Industrial roofs – Crane girders – pre-engineered and Mills buildings - Bunkers and Silos – pipe/cable racks - Chimney.

UNIT IV DESIGN OF R.C. STRUCTURES **9**

Corbels, Brackets and Nibs - Silos and bunkers – Chimney - Principles of folded plates and shell roofs.

UNIT V PREFABRICATION **9**

Principles of prefabrication – Prestressed precast roof trusses - Construction of roof and floor slabs - Wall panels - Storage/transportation/handling in yard/site and erection – Joints in precast structures.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ramamrutham.S. "Design of Reinforced Concrete Structures", Dhanpat Rai Publishing Company, 2007.
2. Bhavikatti.S.S., "Design of Steel Structures", J.K. International Publishing House Pvt. Ltd., 2009.

REFERENCES:

1. Ramachandra and VirendraGehlot, Design of steel structures-2, Scientific Publishers 2012.
2. Varghese.P.C. Advanced Reinforced Concrete Design, PHI, Eastern Economy Editions, Second Edition, 2005.

3. Handbook on Functional Requirements of Industrial buildings, SP32–1986, Bureau of Indian Standards, 1990.
4. Koncz, J., Manual of Precast Construction Vol. I and II, Bauverlay GMBH, 1971
5. Ashoke Kumar Dasgupta, Design of Industrial Structures: Reinforced Cement Concrete and Steel, CBC Press, 2021

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://home.howstuffworks.com/prefab-house.htm
3. https://freevideolectures.com/course/2679/design-of-steel-structures

OUTCOMES:

Upon completion of the course, the student should be able to

1. Classification of industries and industrial structures (K2)
2. Develop knowledge on planning of industrial structures. (K2)
3. Describe the functional requirements of structures. (K2)
4. Analyze and Design steel industrial structures. (K3)
5. Analyze and Design R.C. industrial structures. (K3)
6. Explain the concepts of Prefabrication. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL704 SDG NO. 4,9,11	TOTAL STATION AND GPS SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the working of Total Station and GPS and solve the surveying problems

UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES 9

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies

UNIT II DISTANCE AND ATMOSPHERIC CORRECTION 9

Refractive index (RI) - factors affecting RI - Computation of group for light and near infrared waves at standard and ambient conditions - Computation of RI for microwaves at ambient condition - Reference refractive index - Real time application of first velocity correction. Measurement of atmospheric parameters - Mean refractive index - Second velocity correction -Total atmospheric correction - Use of temperature and pressure transducers.

UNIT III ELECTRO OPTICAL AND MICRO WAVE SYSTEM 9

Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments – Traversing and Trilateration - COGO functions, offsets and stake out - land survey applications.

UNIT IV GPS SATELLITE SYSTEM 9

Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler's Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept – GNSS, IRNSS and GAGAN - Different segments - space, control and user segments - satellite configuration – GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT V GPS DATA PROCESSING 9

GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing – software modules - solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods - satellite geometry & accuracy measures – applications - long baseline processing - use of different softwares.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rueger, J.M., "Electronic Distance Measurement", Springer-Verlag, Berlin, 4th Edition,1996.
2. Satheesh Gopi, Rasathishkumar, N. Madhu, "Advanced Surveying, Total Station GPS and Remote Sensing", Pearson education , 2nd Edition,2017. isbn: 978-81317 00679.

REFERENCES:

1. R.Subramanian, "Surveying and Levelling", Oxford University Press, Second Edition, 2012.
2. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 1983.
3. Guocheng Xu, "GPS Theory, Algorithms and Applications", Springer - Verlag, Berlin, 3rd Edition,2016.
4. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 4th Edition, 2015.
5. Seeber G, "Satellite Geodesy", Walter De Gruyter, Berlin,2nd Edition, 2003.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/107/105107157/
2. https://www.gps.gov/multimedia/launchvideos/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the fundamentals of Total station and its application in civil engineering works (K2)
2. Apply the knowledge of Refractive Index correction in total station surveying (K3)
3. Acquire the knowledge of Atmospheric corrections in total station surveying (K3)
4. Apply the measuring and working principle of electro optical and Microwave system of total station in civil field works. (K2)

5. Understand the basic concepts of GPS including their segments, satellite configuration etc., (K2)
6. Acquire the knowledge about GPS data downloading and processing methods & its applications (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL705 SDG NO. 9,12	DESIGN OF PRESTRESSED CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of prestressing
- To get familiar with the design principles of prestressed concrete
- To get exposed to design of prestressed concrete tanks and pipes
- To have good knowledge on analysis of composite members
- To acquire knowledge on design of prestressed concrete bridges

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DESIGN OF ANCHORAGE ZONE 9

Determination of anchorage zone stresses in post-tensioned beams by Magnel‟s method, Guyon‟s method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V TENSION AND COMPRESSION MEMBERS 9

Role of prestressing in members subjected to Tensile forces and compressive forces - Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

REFERENCES:

1. N. Rajagopalan, "Prestressed Concrete", Narosa Publishing House, 2002.
2. P. Dayaratnam, "Prestressed Concrete Structures", Oxford and IBH, 2013
3. T.Y. Lin and Ned. H. Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4. A. E. Naaman, "Prestressed Concrete Analysis and Design : Fundamentals, Third Edition, Techno Pr 3000, 2012.
5. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

ONLINE RESOURCES:

1. https://studentsfocus.com/ce6702-pcs-notes-prestressed-concrete-structures-lecture-handwritten-notes-civil-7th-sem-anna-university/
2. https://lecturenotes.in/subject/245/prestressed-concrete-structures-pcs

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply basic fundamentals of prestressing. (K2)
2. Determines the losses of prestressing methods.(K2)
3. Design prestressed concrete flexural members. (K3)
4. Design the anchorage zone reinforcement.(K3)
5. Design prestressed concrete tanks and pipes.(K3)
6. Analyze composite members.(K3)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL706 SDG NO. 4,9	FINFITE ELEMENT METHOD	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To educate the students the fundamental concepts of finite element method of analysis and the application of FEM in Engineering.

UNIT I INTRODUCTION TO FINITE ELEMENT ANALYSIS 9

Introduction, Basic Concepts of Finite Element Analysis, Steps in Finite Element Analysis, Fundamental concepts of Elasticity

UNIT II FINITE ELEMENT FORMULATION TECHNIQUES 9

Virtual Work and Variational Principle, Galerkin Approach, Displacement Approach, Stiffness Matrix and Boundary Conditions

UNIT III ELEMENT PROPERTIES 9

Concepts of shape functions: Natural Coordinates, one dimensional,

Triangular, Rectangular Elements, Lagrange and Serendipity Elements Isoparametric Formulation: Isoparametric Elements, Stiffness Matrix of Isoparametric Elements, Numerical Integration: One Dimensional, Two Dimensional

UNIT IV FEM FOR TWO DIMENSIONAL ANALYSIS 9

Constant Strain Triangle, Linear Strain Triangle, Rectangular Elements, Numerical Evaluation of Element Stiffness, Computation of Stresses

UNIT V FEM SOFTWARE IN CIVIL ENGINEERING 9

Formation of stiffness matrices and analysis of Truss, Continuous Beam and Simple Plane Frame. Introduction to application of standard FEM software in civil Engineering

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Y. Desai et. al, "Finite Element Method with Applications in Engineering", Pearson Publishers, 2011
2. Chandrapatla & Belegundu, "Introduction to Finite Element in Engineering", Pearson Education Publishers, 2015

REFERENCES:

1. D. L. Logan, Bannister, Raymond & Baker, A First Course in Finite Element Method Surveying, Thomson Pearson Education Publishers, 2010
2. R. D. Cook et. Al, Concepts and Applications of Finite Element Analysis by , Wiley India Publishers, 2007
3. C. S. Krishnamoorthy, Finite Element Analysis – Theory and Programming, Tata Mcgraw Hill. 2017
4. M. Mukhopadhyay, Matrix, Finite Element, Computer and Structural Analysis , Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India. 2009
5. K. J. Bathe PHI, Finite Element Procedures, New Delhi, India, 1995

ONLINE RESOURCES:

1. https://www.coursera.org/projects/finite-element-method-linear-nonlinear-analysis-post-processing
2. https: //nptel.ac.in/courses /105/104/105104102/

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the basic concepts of Finite Element Analysis. (K2)
2. Apply Finite Element Formulation Techniques such as Virtual Work, Variational Principle and Galerkin Approach (K2)
3. Apply shape functions and isoparametric elements in two and three dimensions (K3)
4. Compute stresses using FEM in two dimensional analysis (K2)
5. Analyse Truss, Continuous beam and Simple Plane frame using FEM (K3)
6. Apply basics of Standard FEM software in Civil Engineering (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL707 SDG NO. 4	COASTAL ZONE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To be able to "see" the features and components of the natural, engineering and human aspects of the coast, the function of component and relationship between them. ·
- To be able to interpretation and analysis of coastal issues to determine appropriate approaches in coastal management.
- To be able to understand the need for coastal zone management and to develop an ICM plan.

UNIT I COASTAL ZONE **9**

Coastal Zone – Beach Profile – Surf Zone – Off Shore – Coastal Waters – Coastal sediments- Estuaries – Wet Lands And Lagoons – Coastal dunes-Coastal Geomorphology.

UNIT II COASTAL RESOURCES **9**

Types and functions of coastal and marine resources- Renewable and Non-Renewable resources – living marine resources and Nonliving marine resources-Marine minerals-placer deposits- hydrocarbon deposits-polymetallic nodules.

UNIT III COASTAL ECOSYSTEM **9**

Marine ecosystem: Mangroves- Sea grass -seaweeds - coral reef- Large marine ecosystem- Climate effects on living marine resources- Biological monitoring of marine ecosystem- Human impacts on marine ecosystem.

UNIT IV COASTAL PROCESSES **9**

Erosion And Depositional Shore Features – Methods Of Protection – Littoral Currents – Coastal Aquifers – Sea Water Intrusion – Impact Of Sewage Disposal In Seas.

UNIT V COASTAL REGULATIONS **9**

Introduction- What is ICM- Developing an ICM framework- Principles-Goals-defining boundaries- Coastal regulations for main land India – coastal regulations for Islands- introduction to coastal regime.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Richard Sylvester, "Coastal Engineering, Volume I And II", Elseiner Scientific Publishing Co., 1999
2. NCSCM straigies and guideline for National implementation of Integrated Coastal zone management, 2013

REFERENCES :

1. Ramesh R and Purvaja R , E- learning moduleon ICZM for UNESCO-IHE, The Netheralands, 2006.
2. Dwivedi, S.N., Natarajan, R And Ramachandran, S., "Coastal Zone Management In Tamilnadu", Madras, 1991.
3. Cicin-Sain, B and Knecht, R.W., Integrated Coastal and Ocean Management: Concepts and Practices. Washington, DC, Island Press, 1998.

4. Kay, R and Jackie Alder. Coastal Planning and Management. Taylor and Francis. 2005 . Clark, J.R.
5. Coastal Zone Management Handbook, CRC Press Environmental Studies 1995.

ONLINE RESOURCES

1. http://civilengineering-notes.weebly.com/water-supply-enginee ring.html
2. https://www.slideshare.net/arohthombre/drainage-system-for-a-building

OUTCOMES:

The Students Completing the Course Will Have Ability to

1. Describe The Coastal Zone Regulations, Coastal Processes And to identify natural, Environmental Law and policy engineering and human components on the coast (K2)
2. Identify appropriate approaches in coastal management and able to communicate effectively in speech and writings (K2)
3. Discuss about different ecosystem available in coastal zones and their importance (K2)
4. Explain about coastal erosion and accretions, impacts of seawage disposal (K2)
5. Describe the principles of ICM (K2)
6. Explain different boundary conditions of coastal regime (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Co1	1	1	1	-	-	1	-	-	1	1	-	1	-	1
CO2	2	2	2	1	2	1	-	1	1	1	1	1	2	2
CO3	3	3	2	1	2	1	-	2	1	1	1	1	1	2
CO4	2	2	3	2	2	1	-	1	1	2	1	1	1	2
CO5	3	3	3	2	2	1	1	1	1	1	1	1	2	2
CO6	3	3	3	2	2	1	1	1	1	1	1	1	2	2

PROFESSIONAL ELECTIVES - III

20CEEL708 SDG NO. 4	GEO-ENVIRONMENTAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques thereby protecting environment.

UNIT I GENERATION OF WASTES AND CONSQUENCES OF SOIL POLLUTION 8

Introduction to Geo environmental engineering – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

UNIT II SITE SELECTION AND SAFE DISPOSAL OF WASTE 10

Safe disposal of waste – Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

UNIT III TRANSPORT OF CONTAMINANTS 8

Contaminant transport in sub surface – Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

UNIT IV WASTE STABILIZATION 10

Stabilization - Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – case studies.

UNIT V REMEDIATION OF CONTAMINATED SOILS 9

Exsitu and Insitu remediation-Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Hari D. Sharma and Krishna R. Reddy, "Geo-Environmental Engineering" –John Wiley and Sons, INC, USA, 2004.
2. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman & Hall, London 1993.

REFERENCES:

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 1995.
2. Wentz, C.A., "Hazardous Waste Management", McGraw Hill, Singapore, 1989
3. Ott, W.R., "Environmental indices, Theory and Practice", Ann Arbor, 1978.
4. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.
5. Lagrega, M.D., Buckinham, P.L. and Evans, J.C., "Hazardous Waste Management" McGraw Hill Inc. Singapore, 1994.

ONLINE RESOURCES

1. https://www.slideshare.net/arohthombre/drainage-system-for-a-building
2. https://www.slideshare.net/AbhinitiGarg23/solid-waste-management-54311362

OUTCOMES:

Upon completion of the vourse, the students will be able to

1. Assess the contamination in the soil (K2)
2. Understand the current practice of waste disposal(K2)
3. To prepare the suitable disposal system for particular waste. (K2)
4. Stabilize the waste and utilization of solid waste for soil improvement. (K2)
5. Discuss various contamination and its transport(K2)
6. Select suitable remediation methods based on contamination. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL709 SDG NO. 4,9	DIGITAL CADASTRE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the students to the Cadastral survey methods and its applications in generation of Land information system.

UNIT I INTRODUCTION **9**

History of cadastral survey - Types of survey - Tax - Real Property – Legal cadastre - Graphical and Numerical cadastre, Legal Characteristics of Records, Torrens System.

UNIT II CADASTRAL SURVEY METHODS **9**

Steps in survey of a village - Instruments used for cadastral survey & mapping - Orthogonal, Polar survey methods - Boundary survey - Rectangulation - Calculation of area of Land - GPS and Total Station in Cadastral survey.

UNIT III PHOTOGRAMMETRIC METHODS **9**

Photogrammetry for cadastral surveying and mapping - Orthophoto map – Quality control measures - Organisation of cadastral offices – International scenario.

UNIT IV CADASTRAL MAPPING AND LIS **9**

Cadastral map reproduction - Map projection for cadastral maps – Conventional symbols - Map - Reproduction processes - Automated cadastral

map, Management of Digital Cadastral. Creation of Land Information System. Integrating LIS – Land administration.

UNIT V MAINTENANCE AND MEASUREMENTS 9

Cadastral survey maintenance - Resurveys - Measurement of sub-division - Measurement of obstructed lines - Survey of urban areas - Control requirement for Urban survey - Use of Satellite Imagery in boundary fixing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.K.Garg, "Digital Land Surveying and Mapping", New Age International Private Limited, 1st Edition, 2021
2. John D. McLaughlin, "An Introduction to Cadastral Surveying", University of New Brunswick, Department of Surveying Engineering, 1973

REFERENCES:

1. Paul. R Wolf., Bon A. DeWitt, "Elements of Photogrammetry with Application in GIS", McGraw Hill International Book Co., 4th Edition, 2014
2. E. M. Mikhail, J. S. Bethel, J. C. McGlone, "Introduction to Modern Photogrammetry", Wiley Publisher, 2001.
3. James, M. Anderson and Edward N. Mikhail, "Introduction to Surveying", McGraw Hill Book Co, 1985.
4. R.Subramanian, "Surveying and Levelling", Oxford University Press, Second Edition, 2012.
5. T. J. Blachut, A. Chrzanowski, J. H. Saastamoinen, "Urban Surveying and Mapping", Springer-Verlag NewYork Inc, 1st Edition, 1979

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105107158
2. https://www.gim-international.com/videos

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand cadastral survey, its types, implementation and legal characteristics. (K2)
2. Derive knowledge on conventional and modern instruments, methods and measurements of cadastral survey. (K2)
3. Apply photogrammetric methods for cadastral surveying, mapping and quality control measures. (K2)
4. Assimilate the processes of cadastral map projection, reproduction and automation & management of digital cadastral. (K2)

5. Appreciate modern methods of creation, integration and administration of land record system. (K2)
6. Comprehend the procedure of cadastral survey maintenance and measurements. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - III

20CEEL710 SDG NO. 6,11,15	TRANSPORT OF WATER AND WASTEWATER ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To educate the students in detailed design concepts related to water transmission mains, water distribution system, sewer networks and storm water drain and computer application on design.

UNIT I GENERAL HYDRAULICS AND FLOW MEASUREMENT 8

Fluid properties, fluid flow - continuity principle, energy principle and momentum principle, frictional head loss in free and pressure flow, minor heads losses, Carrying Capacity - Flow measurement.

UNIT II WATER TRANSMISSION AND DISTRIBUTION 12

Need for Transport of water and wastewater-Planning of Water System - Selection of pipe materials, Water transmission main design - gravity and pumping main, Selection of Pumps - characteristics- economic- Specials, Jointing, laying and maintenance, water hammer analysis, water distribution - pipe networks design, analysis and optimization - appurtenances - corrosion prevention- minimization of water losses - leak detection Storage reservoirs.

UNIT III WASTEWATER COLLECTION AND CONVEYANCE 10

Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design; Wastewater pumps and pumping stations- sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters.

UNIT IV STORM WATER DRAINAGE 8

Necessity- combined and separate system; Estimation of storm water run-off - Formulation of rainfall intensity duration and frequency relationships- Rational methods.

UNIT V CASE STUDIES AND SOFTWARE APPLICATIONS 7

Use of computer software in water transmission, water distribution and sewer design – EPANET 2.0, LOOP version 4.0, SEWER, BRANCH, Canal ++ and GIS based soft wares.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. CPHEEO, "Manual on Sewerage and Sewage Treatment Part-A Engineering", Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Rajput.R.K. "Fluid Mechanics", S. Chand and Co, New Delhi, 2008.

REFERENCES:

1. Pramod R. Bhave, Rajesh Gupta. "Analysis of Water Distribution Networks", Alpha Science International, 2006.
2. Bajwa, G.S. "Practical Handbook on Public Health Engineering", Deep Publishers, Shimla, 2003.
3. Lawler and Benjamin, "Water Quality Engineering: Physical / Chemical Treatment Processes", John Wiley & Sons, 2013.
4. Metcalf & Eddy, "Wastewater engineering, treatment and reuse", McGraw-Hill, 2017.
5. Azadeh Ahmadi, Masih Akhbari, and Mohammad Karamouz, "Groundwater Hydrology, Engineering, Planning, and Management", CRC Press, 2011.

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=5NzMt6PErYo
2. http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=3609

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Illustrate various pipe materials for water supply main, distribution network and sewer various field. (K2)
2. Understand Transport of water and wastewater for Planning of water system and also to Select the appropriate pipe materials for the Water transmission main design- gravity and pumping mains. (K3)
3. Gain knowledge on Special Jointing, laying and maintenance of pipes and appurtenances used and also, to study corrosion prevention, minimization of water losses by leak detection in storage reservoirs. (K3)
4. Understand design concepts related to water transmission mains, water distribution system. (K2)
5. Describe combined and separate system for the Estimation of storm water run-off Formulation of rainfall intensity duration and frequency relationships using Rational methods. (K3)
6. Understand conditions troubleshooting in water and sewage transmission and be able to use various computer Software for the design of water and sewage network. (K3)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - IV

20CEEL801 SDG NO. 4,&9	MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquire the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance, Repair and Rehabilitation - Facets of Maintenance - Importance of Maintenance - Various aspects of Inspection - Assessment procedure for evaluating a damaged structure - causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9

Quality assurance for concrete – Strength, Durability, of concrete - Cracks, different types, causes– Effects due to climate, temperature, Sustained elevated, Corrosion - - Effects of cover thickness.

UNIT III SPECIAL CONCRETES 9

Polymer concrete - Sulphur infiltrated concrete - Fibre reinforced concrete - High strength concrete - High performance concrete - Vacuum concrete - Self compacting concrete - Geopolymer concrete - Reactive powder concrete - Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage and earthquake - Demolition techniques - Engineered demolition methods - Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Shetty.M.S. Jain A K., "Concrete Technology - Theory and Practice", S.Chand and Company , Eighth Edition, 2019.
2. B.Vidivelli, "Rehabilitation of Concrete Structures", Standard Publishers Distribution, 1st edition 2009.

REFERENCES:

1. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
2. Hand Book on "Repair and Rehabilitation of RCC Buildings" – Director General works, CPWD ,Govt of India , New Delhi – 2002
3. P.C.Varghese, Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
4. R.Dodge Woodson, Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann, Elsevier, New Delhi 2012.
5. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2004.

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3489/ocean-structures-and-materials/16
2. https://www.classcentral.com/course/swayam-maintenance-and-repair-of-concrete-structures-17678

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Enumerate the facets, importance and aspects of Maintenance, Repair and Rehabilitation and to describe assessment procedure of damaged structures and it causes of deterioration (K2)
2. Explain the concept of quality assurance of concrete in regards with strength, durability, cracks, crack types and it causes due to climate, temperature, sustained elevated temperature and corrosion (K2)
3. Describe various special concrete like Polymer, Sulphur infiltrated, Fiber reinforced, High strength, High performance, Vacuum, Self compacting, Geo-polymer concrete of repair related to the distress with case studies (K2)
4. Express different techniques for repair and protection methods like NDT, load test stability and corrosion protection techniques (K2)
5. Describe suitable strengthening techniques of repair, rehabilitation and retrofitting of structures distressed due to corrosion, fire leakage, earthquake with case studies (K2)

6. Explain the transportation of structures, structural health monitoring techniques and demolition methods with case studies (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - IV

20CEEL802 SDG NO. 4,9 & 11	TALL BUILDINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the design philosophy of tall buildings, the loading and behaviour of structural systems

UNIT I DESIGN CRITERIA AND MATERIALS 9

Design Philosophy - Modern concepts–Materials used-High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self-Compacting Concrete, High strength steel, Composites.

UNIT II LOADING 9

Gravity Loading– Deadload, Liveload–Liveload reduction techniques, Impact load, Construction load, Sequential loading. Wind Loading–Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading–Equivalent lateral Load analysis, Dynamic Analysis, Combination of Loads

UNIT III BEHAVIOUR OF STRUCTURAL SYSTEMS **9**

Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, in filled frames, Shear walls, Coupled Shearwalls, Wall–Frames,Tubular and Outrigger– Hybrid systems.

UNIT IV ANALYSIS **9**

Modeling for approximate analysis, accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for drift and twist. Computerized 3D analysis.

UNIT V DESIGN PARAMETERS **9**

Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance, Stability of Tall Structures - PΔ Effects, Buckling analysis Of Tall Buildings.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Bryan Stafford Smith and Alex Coull, Tall Building Structures, Analysis and Design, John Wiley and Sons, Inc.,2011.
2. TaranathB.S, Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, McGrawHill,2011.

REFERENCES:

1. Lin T.Y. and Burry D.Stotes, Structural Concepts and Systems for Architects andEngineers, John Wiley, 1994.
2. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
3. Wolfgang Schuler, High Rise Building Structures, John Wiley & Sons, New York, 1986.
4. Kolousek V, Pimer M, Fischer O and Naprstek J, Wind effects on Civil Engineering Structures. Elsevier Publications.1984.
5. Coull, A. and Smith, Stafford, B. " Tall Buildings ", Pergamon Press, London, 1997.

ONLINE RESOURCES:

1. http://www.downloadmela.com/search/?q=CE6012Tall Buildings
2. https://nptel.ac.in/courses/124105013

OUTCOMES:

Upon completion of the course, the student should be able to

1 Explain the philosophy and modern concept of different types of concrete used for the construction of tall buildings(K2)

2. Apply the concept of different types of loading for the study of tall buildings(K3)
3. Calculate static and dynamic wind loading, earthquake loading and combination of load approaches in tall buildings(K2)
4. Identify various structural systems, their behaviour and performance under different loading conditions in tall buildings(K2)
5. Discover various modelling techniques applicable in structures as an integral unit for drift and twist(K3)
6. Describe tall structures under different conditions like stability considerations, creep, shrinkage, and temperature and fire resistance. (K2)

CO- PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - IV

20CEEL803 SDG NO. 4	BUILDING SERVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To create awareness about the importance of sanitation, domestic water supply and fire services
- Development of technical and practical knowledge in these services.

UNIT I WATER SUPPLY **12**

Water requirements for different types of buildings-simple method of removal of impurities-water saving practices and their potential Service connection from mains-sump and storage tank-types and sizes of pipes- special installation in multistoried buildings. Material- types of fixtures and fitting for a contemporary bathroom– taps – quarter turn-half turn- ceramic-foam flow

etc, hot water mixer- hand shower Rainwater harvesting to include roof top harvesting-type of spouts- sizes of rainwater pipes and typical detail of a water harvesting pit

UNIT II DRAINAGE 12

Principles of drainage, surface drainage- shape and sizes of drains and sewers- storm water over flow chambers- methods of laying and construction of sewers Traps – shapes- sizes- types- materials and function- Inspection chambers - sizes and construction- Ventilation of House drainage: Anti siphonage pipe- system of plumbing - single stack , one pipe system- one pipe partially ventilating system and two pipe system- grey water recycling and dual plumbing Types of fixtures and materials: sinks- shower tray- shower temple- bath tub- Jacuzzi- water closets-flushing cisterns-urinals- sinks- wash basins- bidet, etc. Design of Septic tank-Oxidation pond-Dispersion trench and soak pits. Arrangements of fixtures in a bathroom Treatment system- Root zone treatment system, Decentralized Wastewater Treatment Systems (DEWATS)-Soil Bio technology-packaged Bio-Reactor System

UNIT III SOLID WASTE DISPOSAL 5

Approaches for solid waste management -Solid wastes collection and removal from buildings- On-site processing and disposal methods, guidelines for municipal solid waste management -e-waste management Disposal of Wastes: Sanitary land filling-Composting-Vermi-compost- Incineration-Pyrolysis

UNIT IV FIRE FIGHTING SERVICES 12

Classification of buildings based on occupancy-causes of fire and spread of fire-Fire fighting-protection and fire resistance-Fire fighting equipment and different methods of fighting fire-Combustibility of materials- Structural elements and fire resistance- Fire escape routes and elements – planning and design. Wet risers-dry risers-sprinklers-heat detector-smoke detectors-fire dampers-fire doors, etc.

UNIT V PLUMBING AND FIRE FIGHTING LAYOUT OF SIMPLE BUIDINGS4

Application of above studies in current design problems and preparing design layout and details - Plumbing layout of residential and public buildings, Fire fighting layout, Reflected ceiling plan of smoke detectors / sprinklers, etc.

TOTAL 45 PERIODS

TEXT BOOKS

1. S.C.Rangwala, Water supply and sanitary engineering, Charotar publishing house.

2. Charangith shah, Water supply and sanitary engineering, Galgotia publishers.

REFERENCE BOOKS

1. Technical teachers Training Institute (Madras), Environmental Engineering, Tata McGraw Hill publishing Company Limited.
2. M.David Egan, Concepts in Building Fire Safety.
3. A. Kamala & DL Kanth Rao, Environmental Engineering, Tata McGraw – Hill publishing company Limited.
4. E.G.Butcher, Smoke control in Fire-safety Design.
5. National Building Code 2005.

ONLINE RESOURCES

1. https://www.onlinestudies.com/Courses/Building-Services/
2. https://www.mastersportal.com/studies/46963/building-services-engineering.html

OUTCOMES

Upon completion of the course student will be able to

1. Understand the water requirement for various types of building and installation of water supply system in buildings. (K2)
2. Acquire the knowledge of various drainage systems with their components for Buildings. (K2)
3. Acquire the knowledge of various ventilation systems with their components and methods for buildings. (K2)
4. Apply the knowledge of solid waste disposal in the buildings works. (K2)
5. Understand the basic concepts of fire fighting services and various methods of installation in Building works. (K2)
6. Derive the basic knowledge of plumbing and fire fighting layout for simple building works. (K2)

CO - PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - IV

20CEEL804 SDG NO. 4	COMPOSITE STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the Physical and Mechanical properties of composite materials and to analyze the behaviour of composite structures with various joints.

UNIT I INTRODUCTION **9**

Introduction to composite construction – Basic concepts – Types of composite materials - Application of composite construction in Civil Infrastructure – Durability – Physical and Mechanical properties of composite structures – Influence of moisture at consistent level in composite structure – Construction of composite structures.

UNIT II MANUFACTURE OF COMPOSITE MATERIALS **9**

Introduction – Fabrication Process – Quality Control during Manufacture – Testing Methodologies – Destructive and Non destructive testing - Mitigation Strategies – Materials and their properties – Stiffness properties – Strength properties – Manufacture of composite materials.

UNIT III PROPERTIES **9**

Introduction – Combustion of Polymer Composites – Fire reaction properties of Polymer Composites – Fire resistant Polymer Composites – Structural properties of Polymer Composites in Fire – Fire protection coatings – Predictive Modelling of Fatigue – Descriptive Modelling of Fatigue.

UNIT IV COMPOSITE BEAMS **9**

Analysis of composite beams – Composite floor – Girders – Slabs - Composite column subjected to axial loads and moment – Shear connectors: functions and types – Maximum stress theory – Maximum strain theory – Stress strain relations - Analysis procedures of building for gravity and lateral loads - Study of IS: 11384 , IRC – 22 and their applications.

UNIT V JOINTS **9**

Introduction – Classes of joints – Bonded joints – Stress distribution – Modes of failure – Merits and demerits – Mechanical joints – Failure mode – Merits and demerits – Design of bonded and bolted joints – Bending failure – Tension failure – Multi bolt joints and its design.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Madhujit Mukhopadhyay; Mechanics of composite materials and structure, Universities press, Telangana, 2004.
2. Jones, R.M., Mechanics of composite materials, McGraw Hill, Tokyo, 1998.

REFERENCE BOOKS

1. Carlo Pelleqrino, Josesena, Cruz; Design procedure for the use of composites in strengthening of reinforced concrete structures, Springer, 2016.
2. Ravindra K. Dhir, kelvin a paine, moray d. Newlands, Composites materials in concrete construction, Ice publishing, 2012.
3. Vistasp M. Karbhari, Durability of composites for civil structure applications, woodhead publishing, 2012.
4. Lawrance C. Bank, Composite Construction, John Weiley sons & inc, USA, 2006
5. Manoj Kumar Buragohain, Composite Structures Design, Mechanics, Analysis, Manufacturing, and Testing, CRC Press, 2017

ONLINE RESOURCES

1. http://civilengineering-notes.weebly.com/water-supply-engineering.html
2. https://www.slideshare.net/arohthombre/drainage-system-for-a-building

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the concept of composite construction (K2)
2. Explain in detail about the manufacturing of composite materials (K2)
3. Knowing the properties of composites (K2)
4. Understand the theory and design of steel concrete composite structures. (K3)
5. Understand the behaviour of composite structures. (K3)
6. Understand the different types of connections in composite structures and their design (K3)

CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - IV

20CEEL805 SDG NO. 4	CONTRACT LAWS AND REGULATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the specific contracts that are pervasive and play a significant role in the day to day commercial transactions besides the law that governs them.
- To know Indian Contract Act, 1872, judgements of the courts in India, United Kingdom and United States of America, other relevant legal material and authoritative scholarship.

UNIT I CONSTRUCTION CONTRACTS **9**

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

UNIT II TENDERS **9**

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamil Nadu Transparency in Tenders Act.

UNIT III ARBITRATION **9**

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

UNIT IV LEGAL REQUIREMENTS **9**

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

UNIT V LABOUR REGULATIONS **9**

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamil Nadu Factory Act – Child Labour Act - Other Labour Laws.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Datta B.N., Estimating and costing, UBSPD Publishing House, New Delhi.
2. M. Chakraborthi; Estimation, Costing and Specifications, Laxmi Publications.

REFERENCE BOOKS

1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, LexisNexis ButterWorths India, 2000
2. Jimmie Hinze, Construction Contracts, McGraw Hill, New Delhi, 2001.
3. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, New Delhi, 2000.
4. Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., Fundamentals of Construction Management and Organisation, Prentice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
5. Patil B.S, Civil Engineering Contracts and estimate, Orient Black swan, Telangana. 2006.

ONLINE RESOURCES

1. https://www.mastersportal.com/studies/46963/building-services-engineering.html
2. https://www.academiccourses.com/Courses/Building-Services/

OUTCOMES

Upon completion of the course, the student should be able to:

1. Discuss elements and types of contracts satisfying international standards. (K2)
2. Describe evaluation of tender act fulfilling the commercial points of views and guidelines. (K2)
3. Illustrate the conditions of arbitration , laws of actions and Enforcement of Award. (K3)
4. Relate various types of laws Governing Sale, inline with different tax laws. (K3)
5. Construct Statutory Regulations and Local Government Laws for Approval in legal planning. (K3)
6. Summarize laws related to labour regulations , social security and Child Labour Act. (K2)

CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - IV

20CEEL806 SDG NO. 6,11 &15	LIFE CYCLE ASSESSMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concept and methodology of Life Cycle Assessment as per international standards, its potential applications to develop sustainable products and promote sustainable consumption.

UNIT I INTRODUCTION TO LCA 6

Life Cycle Assessment (LCA): Goal and scope definition, inventory data analysis, impact assessment and improvement analysis.

UNIT II LCA METHODS AND STANDARDS 6

LCA methods, ISO standards for LCA, Software tools available for LCA,

UNIT III CONCEPT OF SUSTAINABILITY 12

Building life cycle, resource use in the built environment, major environmental issues, three pillars of sustainability, parameters affecting resource use in the building life cycle, roadmap for built environment sustainability, construction ecology, and Principles of green engineering. Measures of Sustainability: Simple and composite indicators.

UNIT IV ENERGY CONSERVATION IN LCA PERCEPTIVE 12

Embodied energy of materials and construction processes, embodied energy databases. Life cycle energy use in buildings: Indirect embodied energy (materials), Direct embodied energy (construction processes), total initial embodied energy, operating energy, recurring embodied energy, demolition energy,

UNIT V CASE STUDY ON LCA 9

case studies on life cycle energy use. Energy use for on-site construction processes, case studies and Calculators for estimating carbon footprint, Green building ratings.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. H. Scott Matthews, Chris T. Hendrickson, and Deanna Matthews, Life Cycle Assessment: Quantitative Approaches for Decisions that Matter, 2014. Open access textbook, retrieved from https://www.lcatextbook.com/.
2. Michael Z. Hauschild Ralph K. Rosenbaum Stig Irving Olsen, Life Cycle Assessment: Theory and Practice

REFERENCES:

1. Walter Klöpffer , Birgit Grahl, Life Cycle Assessment (LCA): A Guide to Best Practice
2. Liv Haselbach (2010) The Engineering Guide to LEED-New Directions (Green Source): Sustainable construction, McGraw-Hill Professional.
3. James A. Fava, Bruce Jones, A Technical Framework for Life-Cycle Assessment

4. International Organization for Standardization: ISO TR 14062 Environmental management - Integrating environmental aspects into product design and development, 2002.
5. David F Ciambrone , Environmental Life Cycle Analysis, CRC Press LLC, 1997

ONLINE RESOURCES:

1. https://www.lcatextbook.com/versions-of-textbook/
2. https://archive.nptel.ac.in/courses/105/105/105105157/
3. http://www.uneptie.org /sustain / lcinitiative , 2004.

OUTCOMES:

Upon completion of the course, the student should be able to:

1. Understand the fundamental elements of Life Cycle Assessment like Goal, Scope, inventory, impact and improvement analysis.(K2)
2. Develop Products and services complying to international environmental management system standards (K3)
3. Explain the pillars of sustainability, major environmental issues, roadmap for achieving sustainability, green building engineering……(K3)
4. Study the concept of Embodied energy of materials and construction processes, embodied energy databases (K2)
5. Implement the Life cycle energy use in Buildings like indirect embodied energy, Direct embodied energy, total initial embodied energy, operating energy, recurring embodied energy, demolition energy. (K3)
6. Demonstrate the Case Studies relevant to LCA(K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVES - IV

20CEEL807 SDG NO. 4	ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To review the history of ancient architecture and to study the planning concept of various classes of buildings

UNIT I REVIEW OF ARCHITECTURE **9**

Review of History of Architecture – Egyptian Mesopotamia classical and Indian Buddhist Architecture – Evolution of Hindu temple Architecture- Islamic and Mughal Architecture – Cross culture influences – Influences of Architecture on Nature, Climate, Topography and Materials – Represented plan – Growth of mass from plan – Space organization – Principles of composition, contrast, proportion, scale, balance, unity, character of composition.

UNIT II CLIMATE, VENTILATION AND LIGHTING **9**

Shelter or form – Climate and thermal comfort in India – Passive heating and cooling strategies – settlement patterns and site planning – Openings in Hot climates – Wind, Sun and Shading – Day lighting and shading – Natural ventilation of buildings in India – Appropriate Technology for a Climatically Responsive LowEnergy Architecture – Projects and Case studies.

UNIT III RESIDENTIAL BUILDINGS **9**

Planning of residential buildings – Space units of Living, Dining, Sleeping areas, Kitchens and Bathrooms – Single storied, Double storied Residential buildings with different roofing systems – Multiple accommodations – Apartments – Group Housing – Gated Communities – Housing for Handicapped – Housing for Elderly – Youth Hostels.

UNIT IV COMMERCIAL BUILDINGS **9**

Planning concept of commercial buildings – Requirements of Spaces – Parking standards – Shopping centre – Banks – Super Markets - Hotel / Motel – Planning concept of Health Structures – requirements of spaces depends on specialty of disease – Medical Centres – Sub Health Centres – Laboratories – Medical Institutions – Concept Line Drawings – Projects.

UNIT V INSTITUTIONAL STRUCTURES **9**

Planning concept of Institutional Structures – General Planning Concept of Play way / Kinder Garden Schools, Elementary, Secondary and Senior Secondary Schools, Library buildings – Technical Institutions – Institutions for Humanities Studies – Gymnasium and Swimming Pools – Planning concepts of Industrial Structures – General – Workshop – Ware Houses – Machine Housings.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Joseph De Charia & John Callender "Time saver standards for Building Types", 3rd Edition, Mc GrawHill International Edition, 2001.
2. Aravind Krishnan, Simos Y Annas, Nick Baker and S.V. Szokolay "Climate responsive architecture (ADesign Hand Book for Energy Efficient Buildings)", 2002.

REFERENCE BOOKS:

1. Earnest Pickering "Architecture Design" John Wiley & Sons, 2009
2. Pratap Rao.M., "Architectural Design - Theory & Design shopping Centre Designs", International Council of Shopping Centres, 2013
3. Julius Panero, Martin Zelnik, "Human Dimension and Interior Space", Whitney Library of Design, 1975
4. Ernst Neuferts, "Architects Data", Blackwell, 2002
5. Ramsey et al, "Architectural Graphic Standards", Wiley, 2000

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/124107012
2. https://nptel.ac.in/courses/124106009

OUTCOMES

Upon completion of the course, the students should be able to

1. Discuss the history of Architecture and its principles for cultivating the growth of cultural influences (k2)
2. Describe appropriate technologies for climate and thermal comfort in india(k2)
3. Summarize the Planning of residential buildings(k2)
4. Distinguish multI accommodations feasibilities in Group Housing , Gated Communities , Housing for Handicapped , Housing for Elderly and Youth Hostels.(k2)
5. Choose the ideal requirement for spaces fulfilling the requirements of health structures(k3)

6. Explain the different concepts in planning of Institutional , industrial and workshop structures (k2)

CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - IV

20MGEL801 SDG NO. 3,4,5,8, 10,13,14,15,16	PROFESSIONAL ETHICS AND VALUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objectives of this course are to provide students of engineering with:

- An understanding of their duties and responsibilities as professionals through gaining knowledge of the philosophies of ethics, professional practice, and world culture.
- Basic knowledge to make informed ethical decisions when confronted with problems in the working environment.
- Improved awareness of potential ethical issues within an engineering context.
- Team skills through working in teams on assignments and in-class assignments.
- Subjective analytical skills through investigation and evaluation of ethical problems in engineering settings using accepted tests for moral problem solving.
- An understanding of how societal morals vary with culture and its influence on ethical thought and action.
- Improved communications skills with regard to ethical and professional issues in engineering.
- Know some of the classic cases as well as contemporary issues in engineering ethics.

UNIT I HUMAN VALUES

Morals, Values, and Ethics – Integrity –Trustworthiness – Work Ethics – Service-Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II PRINCIPLES FOR HARMONY

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties – Aspirations and Harmony (I, We & Nature) – Gender Bias – Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III ENGINEERING ETHICS AND SOCIAL EXPERIMENTATION

History of Ethics – Need of Engineering Ethics – Senses of Engineering Ethics- Profession and Professionalism ––Self Interest – Moral Autonomy – Utilitarianism – Virtue Theory – Uses of Ethical Theories – Deontology- Types of Inquiry –Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma – Comparison with Standard Experiments –– Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law – Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV ENGINEERS' RESPONSIBILITIES TOWARDS SAFETY AND RISK

The concept of Safety – Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences – Risk Assessment –Accountability – Liability – Reversible Effects – Threshold Levels of Risk – Delayed v/sImmediate Risk – Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V ENGINEERS' DUTIES AND RIGHTS

Concept of Duty – Professional Duties – Collegiality – Techniques for Achieving Collegiality – Senses of Loyalty – Consensus and Controversy – Professional and Individual Rights – Confidential and Proprietary Information – Conflict of Interest-Ethical egoism – Collective Bargaining – Confidentiality – Gifts and Bribes – Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI GLOBAL ISSUES

Globalization and MNCs –Cross Culture Issues – Business Ethics – Media Ethics – Environmental Ethics – Endangering Lives – Bio Ethics – Computer Ethics – War Ethics – Research Ethics -Intellectual Property Rights.

TEXT BOOKS:

1. M.Govindarajan, S.Natarajan and V.S.SenthilKumar, "Engineering Ethics & Human Values", PHI Learning Pvt. Ltd., 2009.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill – 2003

REFERENCE BOOKS:

1. Sekhar, R.C., "Ethical Choices in Business Response Books", New Delhi, Sage Publications, 1997.
2. Kitson, Alan and Campebell, Robert, "The Ethical Organisation", Great Britain Macmillan Press Ltd., 1996.
3. Pinkus, Rosa Lyun B., Larry J Shulman, Norman Phummon, Harvey Wolfe, "Engineering Ethics",New York, Cambridge Uty., Press, 1997.
4. R. Subramaniam, "Professional Ethics", Oxford Publications, New Delhi.
5. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill – 2003.
6. Prof.A.R.Aryasri, Dharanikota Suyodhana, "Professional Ethics and Morals" Maruthi Publications.
7. Harris, Pritchard, and Rabins, "Engineering Ethics", Cengage Learning, New Delhi.
8. S. B. Gogate, "Human Values & Professional Ethics", Vikas Publishing House Pvt. Ltd., Noida.
9. A. Alavudeen, R.Kalil Rahman and M. Jayakumaran, "Professional Ethics and Human Values", University Science Press.
10. Prof.D.R.Kiran, "Professional Ethics and Human Values" Tata McGraw-Hill – 2013.
11. Jayshree Suresh and B. S. Raghavan, "Human Values and Professional Ethics", S.Chand Publications.

WEB RESOURCES:

1. Ethos Education provides a concise guide on developing a code of ethics for primary and secondary schools.
2. The Ethics Resource Center has a toolkit available for use. When used for commercial purposes, a nominal license fee is required.
3. Creating A Code Of Ethics for Your Organization, with many suggested books, by Chris MacDonald
4. The Deloitte Center for Corporate Governance offers a variety of resources for those who are active in governance, including a variety of resources and a set of suggested guidelines for writing a code of ethics or a code of conduct.

MOOC REFERENCES:

1. https://www.udemy.com/course/worlplace-ethics-and-attitude/
2. https://www.udemy.com/course/business-ethics-how-to-create-an-ethical-organization/
3. https://nptel.ac.in/courses/110/105/110105097/Ethics in Engineering Practice
4. https://nptel.ac.in/courses/109/104/109104068/Human Values
5. https://www.coursera.org/learn/ethics-technology-engineering
6. https://www.classcentral.com/course/ethics-technology-engineering-10485

OUTCOMES:

Upon completion of the corse, the students will be able to

1. Classify between ethical and non-ethical situations. (K2)
2. Discuss and practice moral judgment in conditions of dilemma. (K2)
3. Explain and relate the code of ethics to social experimentation and real world scenarios. (K2)
4. Describe risk and safety measures in various engineering fields. (K2)
5. Explain the impact of engineering solutions in a global/societal / professional context. (K2)

CO- PO MAPPING:

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

PROFESSIONAL ELECTIVES - IV

20MGEL501 SDG NO. 4,8,9,12	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To get an introductory insight about the IPR in national and international context.
- To understand the procedures for IPR, registration and its eforcement.

UNIT I INTRODUCTION **9**

Intellectual property: Introduction, Meaning, Nature and significance types of intellectual property, importance of intellectual property rights, Protection of human innovations by IPR such as Patents, Trademarks, Copyright, Industrial Designs Geographical Indications, and Trade Secrets

UNIT II AGREEMENTS AND TREATIES **9**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, General agreement on trade and tariff (GATT), Ben convention, Rome convention ,Role of WTO and WIPO

UNIT III PATENTS **9**

Concept of Patent – Historical view of Patent system in India and International Scenario, patent searching process, ownership rights and transfer, compulsory licenses, Procedure for filing of patents, Grants of patent , Benchmarks for patentability of inventions, Recent key changes and development.

UNIT IV TRADEMARKS AND COPYRIGHTS **9**

Concept of Trademarks and copyrights – Rationale behind the protection-Purpose, function and acquisition, ownership issues, Procedure for Registration, Industrial design and integrated circuits, protection of geographical indications and plant varieties, Recent Trends in copyrights and Trademark., Trade secrets -liability for misappropriations of trade secrets

UNIT V LEGAL ASPECTS AND NEW DEVELOPMENTS **9**

Infringements of patents– Criteria of Infringement – Modes of Infringement-remedies and modification Protection against unfair competition, enforcement of intellectual property rights, Intellectual property audits, New developments of intellectual property, Impact of international instruments

relating to the protection of intellectual properties Future of IPR in National and International levels.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
3. P.Narayanan, Intellectual property rights Eastern law house-2018 3rd Edition (revised and updated)
4. Deborah, E. Bouchoux, Intellectual property right, Cengage learning-2018 5th Edition

REFERENCES

1. Sterling, J. L. A., World copyright law, (2008) 3rd Edition, London, Sweet & Maxwell
2. GP Reddy, Intellectual property rights & other laws, Gogia law agency
3. Barrett, Margreth, Intellectual Property, (2009) 3rd Edition, New York Aspen publishers
4. Inventing the Future: An introduction to Patents for small and medium sized Enterprises; WIPO publication
5. Cornish, William Intellectual Property: Patents, Copyright, Trademarks and allied rights, (2010) 7th Edition, London Sweet & Maxwell.
6. Kankanala and Kalyan.C : Indian Patent Law and Practice (2010), India, Oxford University Press

WEB RESOURCES:

1. https://www.wipo.int/edocs/lexdocs/laws/en/ws/ws020en.pdf
2. http://caaa.in/Image/34_Hb_on_IPR.pdf
3. http://www.ipindia.nic.in/patents.htm
4. http://www.ipindia.nic.in/trade-marks.htm
5. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf
6. https://economictimes.indiatimes.com/small-biz/resources/startup-handbook/intellectual-property-rights- registration/articleshow/59126802.cms?from=mdr

ONLINE RESOURCES:

1. https://www.coursera.org/learn/introduction-intellectual-property

2. https://www.edx.org/course/intellectual-property-law-and-policy-part-1
3. https://www.classcentral.com/tag/intellectual-property
4. https://swayam.gov.in/nd1_noc19_mg58/preview

OUTCOMES:

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

1 Describe the concepts of Intellectual property rights. (K2)
2 Explain the agreements and treaties of Intellectual property rights. (K2)
3 Identify the needs and avenues for patents. (K2)
4 Discuss the necessity of Trade marks and Copy rights. (K2)
5 Explain the legal context and developments of Intellectual property rights. (K2)

CO - PO, PSO MAPPING

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

PROFESSIONAL ELECTIVES - IV

20MGEL803 SDG NO. 4,8	ENGINEERING ECONOMICS AND COST ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To analyse cost/revenue data and carry out make economic analysis in the business decision making
- To impart and train the students to cost estimation of components
- To enhance knowledge about value engineering
- To understand about the cash and fund statements in various Industry
- To justify or reject alternatives and opportunities on an economic basis based on Business decision

UNIT I BASIC ECONOMICS 8

Definition of economics - nature and scope of economic science - nature and scope of Managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of Production - land - its peculiarities - labour - economies of large and small scale - consumption - Wants - its characteristics and classification - law of diminishing marginal utility – relation Between economic decision and technical decision.

UNIT II DEMAND AND SCHEDULE 8

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply – supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly – monopolistic competition.

UNIT III ORGANISATION 8

Forms of business - proprietorship - partnership - joint stock company - cooperative organization - state enterprise - mixed economy - money and banking - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument.

UNIT IV FINANCING 8

Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement.

UNIT V COST AND BREAK EVEN ANALYSES 13

Types of costing – traditional costing approach - activity base costing - Fixed Cost – variable cost – marginal cost – cost output relationship in the short run and in long run – pricing practice – full cost pricing – marginal cost pricing – going rate pricing – bid pricing – pricing for a rate of return – appraising project profitability –internal rate of return – pay back period – net present value – cost benefit analysis – feasibility reports – appraisal process – technical feasibility economic feasibility – financial feasibility. Break even analysis - basic assumptions – break even chart – managerial uses of break-even analysis.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Dewett K.K. & Varma J.D., "Elementary Economic Theory", S Chand & Co., 2006
2. Sharma JC "Construction Management and Accounts" Satya Prakashan, New Delhi.

REFERENCES:

1. Paneer selvam.R, "Engineeirng economics", Prentice Hall of India Ltd, New Delhi, 2001.
2. G L Moore and R K Jaekicke, "Managerial Accounting".
3. A Matz and M F Usry, "Cost Accounting Planning and Control".
4. H N Wein gamer, "Mathematical Programming and the Analysis of Capital Budgeting Problems".
5. John A White, "Principles of Engineering Economic Analysis".

WEB REFERENCES:

1. https://www.phindia.com/Books/BookDetail/9788120341678/engineering-economics-and-costing-mishra
2. https://www.phindia.com/Books/BookDetail/9788120351721/process-planning-and-cost-estimation-panneerselvam-sivasankaran
3. https://www.phindia.com/Books/BookDetail/9788120348370/engineering-economics-panneerselvam
4. https://www.coursera.org/lecture/faecalsludge/4-7-engineering economics-KoVa9
5. https://www.classcentral.com/course/swayam-engineering-economicanalysis-9919
6. https://nptel.ac.in/courses/105/103/105103023/
7. https://www.youtube.com/watch?v=uCYKmwv_1dE
8. https://www.youtube.com/watch?v=TywirlymIDY
9. https://www.udemy.com/course/construction-projects-costestimation-advanced-course/
10. https://www.edx.org/course/structural-materials-selection-and economics

OUTCOMES:

Upon completion of the course, the student should be able to

1. Able to understand the basic concepts of Demand and Supply.
2. Can able to prepare cost statement and analyse the cost of product.
3. Can predict the market competition.

4. Better insight on the pricing strategies and price war.
5. Deep knowledge of applying costing into construction area.

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

Imagine the Future and

Make it happen!

Together let's build a better world where there is NO POVERTY and ZERO HUNGER. We have GOOD HEALTH AND WELL BEING QUALITY EDUCATION and full GENDER EQUALITY everywhere. There is CLEAN WATER AND SANITATION for everyone. AFFORDABLE AND CLEAN ENERGY which will help to create DECENT WORK AND ECONOMIC GROWTH. Our prosperity shall be fuelled by investments in INDUSTRY, INNOVATION AND INFRASTRUCTURE that will help us to REDUCE INEQUALITIES by all means. We will live in SUSTAINABLE CITIES AND COMMUNITIES. RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet. CLIMATE ACTION will reduce global warming and we will have abundant, flourishing LIFE BELOW WATER, rich and diverse LIFE ON LAND. We will enjoy PEACE AND JUSTICE through STRONG INSTITUTIONS and will build long term PARTNERSHIPS FOR THE GOALS.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **People like you.**

Together we can...

Sai Prakash Leo Muthu

Chairman & CEO – Sairam Institutions

We build a Better nation
through Quality education.

Sairam
INSTITUTIONS

Sri SAI RAM ENGINEERING COLLEGE

An Autonomous Institution

Affiliated to Anna University & Approved by AICTE, New Delhi

*Accredited by **NBA** and **NAAC** "**A+**"*
***ISO** 9001:2015 Certified and MHRD **NIRF** ranked institutions*

College Campus
Sai Leo Nagar, West Tambaram,
Chennai - 600 044. Ph : 044-2251 2222

Administrative Office
"Sai Bhavan", 31B, Madley Road, T.Nagar,
Chennai - 600 017. Ph : 044-4226 7777

e-mail : sairam@sairamgroup.in

www.sairamgroup.in