JERUSALEM COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to Anna University, Chennai)

VISION OF THE INSTITUTION

Jerusalem College of Engineering is committed in emerging as an international institution of excellence in imparting finest quality engineering, technology and management education rooted in ethical and societal values through various academic programmes, multi-disciplinary research, consultancy and entrepreneurship activities and hence to contribute towards social transformation and nation building.

MISSION OF THE INSTITUTION

- Generating abundant resources and making conducive policies, the management led by the Chief Executive Officer strives towards promoting globally competitive academic programmes augmented with value added courses, in-plant training activities, co-curricular activities and ambience that support intellectual growth and skill acquisition

- Promoting collaborative trans-border research programmes continuing education in synergy with academia, industries and research organizations leading to real time solutions and life-long learning

- Transforming young men and women into competent professionals and entrepreneurs motivated by a passion for professional excellence, driven by human values and proactively engage in the betterment of the society through innovative practices and academic excellence

- Facilitating effective interaction among faculty members and students and fostering network of alumni, industries, institutions and other stake-holders for successful career gain and placement

JERUSALEM COLLEGE OF ENGINEERING, CHENNAI – 600 100

(An Autonomous Institution, Affiliated to Anna University, Chennai)

DEPARTMENT OF CIVIL ENGINEERING

VISION

To become center of Excellence that brings out technically competent Civil Engineers with moral and ethical values, inculcating applied research innovation for industrial and societal needs.

MISSION

- To impart Quality education through innovative teaching methods.
- Enhancing and enriching the students' knowledge with latest technological advancements.
- To promote consultancy for industrial and social needs through innovative projects and research.
- To train and expose the students so as to meet the challenges at international level and to sustain as entrepreneurs.

JERUSALEM COLLEGE OF ENGINEERING, CHENNAI – 600 100

(An Autonomous Institution, Affiliated to Anna University, Chennai)

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1: To prepare students for successful careers in Civil Engineering field that meets the needs of Indian and multinational companies

PEO-2: To develop the confidence and ability among students to synthesize data and technical concepts and thereby apply it in real world problems.

PEO-3: Graduates will exhibit adequate communication, leadership, problem solving and decision-making skills by understanding contemporary issues in industry and contribute to career progress.

PEO-4: Graduates will be competent in academics and a segment of our graduates will pursue higher studies and involve in research and development in the different disciplines of civil engineering.

PEO-5: Facilitate the moral and ethical standards in Engineering to grow professionally as a dynamic entrepreneur and service oriented professional with strategic leadership qualities.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO-1: Students will be able to design and analyze various structural components.

PSO-2: Students will able to develop sustainable and environment friendly projects.

PROGRAM OUTCOMES (POs)

PO-1. An ability to apply knowledge of mathematics, science and engineering

PO-2. An ability to design and conduct experiments, as well as to analyze and interpret data.

PO-3. An ability to develop code, design of system, component, or process to meet desired needs within realistic constraints such s economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

PO-4. An ability to identify, formulate, and solve engineering as well as computer based problems

PO-5. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

PO-6. An ability to be a responsible entrepreneur who with their design and analysis improve the process and performance of socio-economic system.

PO-7. To broad education necessary to understand the impact of engineering and computer based solutions in a global, economic, environmental, and societal context.

PO-8. An understanding of professional and ethical responsibility

PO-9. An ability to function on multidisciplinary terms

PO-10. An ability to communicate effectively

PO-11. An ability to be a multidisciplinary personality which aids themto be innovative and achieve phenomenal chances in research field

PO-12. Recognition of the need for, and an ability to engage in life-longlearning

JERUSALEM COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to Anna University)
B.E. CIVIL ENGINEERING

REGULATIONS - 2019

TOTAL CREDIT SHEETS

Initials /Sem	HS	BS	ES	PC	PE	EEC	OE
I	3	10	10	0	0	0	0
II	3	6	8	5	0	0	0
III	0	3	9	6	0	0	0
IV	0	3	0	12	3	1	3
V	1	0	0	13	3	1	3
VI	0	0	3	12	3	1	3
VII	0	0	0	8	6	5	3
VIII	0	0	0	0	0	10	0
Total	7	22	30	57	15	17	12
Total Credit =160							

TOTAL CREDITS TO BE EARNED FOR AWARD OF THE DEGREE: 160

JERUSALEM COLLEGE OF ENGINEERING

(AN AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY,CHENNAI)

B.E. CIVIL ENGINEERING

REGULATION 2019

CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM AND SYLLABI

SEMESTER 1

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1121	Communicative English and Soft Skills I	HS	4	2	0	2	3
2	JMA1101	Matrices and Calculus	BS	4	2	2	0	3
3	JPH1101	Engineering Physics	BS	3	3	0	0	3
4	JCY1101	Engineering Chemistry	BS	3	3	0	0	3
5	JGE1101	Engineering Basics	ES	3	3	0	0	3
6	JGE1102	Programming in C	ES	3	3	0	0	3
PRACTICALS								
7	JPC1111	Physics and Chemistry Laboratory	BS	2	0	0	2	1
8	JGE1111	Design Appreciation Laboratory	ES	4	0	0	4	2
9	JGE1112	Programming in C Laboratory	ES	4	0	0	4	2
TOTAL				**30**	**16**	**2**	**12**	**23**

SEMESTER 2

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1221	Technical English and SoftSkills II	HS	4	2	0	2	3
2	JMA1201	Vector Calculus and Complex Analysis	BS	4	2	2	0	3
3	JBE1222	Applied Science for Civil Engineering	BS	4	2	0	2	3
4	JGE1201	Python Programming	ES	3	3	0	0	3
5	JCE1201	Engineering Mechanics	PC	4	2	2	0	3
6	JGE1202	Engineering Graphics & Design	ES	5	1	0	4	3

7	JNC1261	Environmental Science	NCM	3	3	0	0	0
PRACTICALS								
8	JGE1211	Python Programming Laboratory	ES	4	0	0	4	2
9	JCE1211	Computer Aided Building Drawing	PC	4	0	0	4	2
TOTAL				**35**	**5**	**4**	**16**	**22**

SEMESTER 3

S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY								
1	JMA1302	Transforms and Partial Differential Equations	BS	4	2	2	0	3
2	JCE1301	Surveying	ES	3	3	0	0	3
3	JCE1302	Sustainable Building Materials	ES	3	3	0	0	3
4	JCE1303	Fluid Mechanics	ES	4	2	2	0	3
5	JCE1304	Structural Mechanics	PC	4	2	2	0	3
PRACTICALS								
6	JCE1311	Surveying Laboratory	PC	4	0	0	4	2
7	JCE1312	Strength of Materials Laboratory	PC	2	0	0	2	1
8	JPT1001	Soft Skills and Aptitude I	EEC	2	0	0	2	*
TOTAL				**26**	**2**	**6**	**8**	**18**

- Only internal assessments will be conducted in the 3rd semester while the end semester examination will be conducted in the 4th semester

SEMESTER 4

S.NO	CCOURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JMA1402	Statistics and Numerical Methods	BS	4	2	2	0	3
2	JCE1401	Soil Mechanics	PC	3	3	0	0	3
3	JCE1402	Open Channel Hydraulics and FluidMachinery	PC	4	2	2	0	3
4	JCE1403	Theory of Structures	PC	4	2	2	0	3
5	-	Professional Elective1	PE	3	3	0	0	3
6	-	Open Elective 1	OE	3	3	0	0	3
PRACTICALS								
7	JCE1411	Soil MechanicsLaboratory	PC	2	0	0	2	1
8	JCE1412	Hydraulics Machinery Laboratory	PC	4	0	0	4	2
9	JPT1001	Soft Skills andAptitude II	EEC	2	0	0	2	1
TOTAL				**29**	**15**	**6**	**8**	**22**

SEMESTER 5

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCE1501	Design of Reinforced Concrete Structures	PC	4	2	2	0	3
2	JCE1502	Advanced Theory of Structures	PC	4	2	2	0	3
3	JCE1503	Foundation Engineering	PC	3	3	0	0	3
4	JCE1504	Water Supply Engineering	PC	3	3	0	0	3
5	-	Professional Elective2	PE	3	3	0	0	3
6	-	Open Elective 2	OE	3	3	0	0	3
PRACTICALS								
7	JCE1511	Construction Materials Laboratory	PC	2	0	0	2	1

8	JHS1511	Professional Communication	HS	2	0	0	2	1
9	JPT1002	Technical Skills and Aptitude I	EEC	2	0	0	2	*
10	JCE1551	Survey Camp	EEC	-	-	-	-	1
TOTAL				**26**	**16**	**4**	**6**	**21**

*****Only internal assessments

SEMESTER 6

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCE1601	Irrigation Engineering and HydraulicsStructures	PC	3	3	0	0	3
2	JCE1602	Waste water Engineering	PC	3	3	0	0	3
3	JCE1603	Design of Steel Structures	PC	4	2	2	0	3
4	JCE1604	Transportation System Engineering	ES	3	3	0	0	3
5	-	Professional Elective 3	PE	3	3	0	0	3
6	-	Open Elective 3	OE	3	3	0	0	3
PRACTICALS								
7	JCE1611	Environment and Irrigation Engineering Drawing	PC	2	0	0	2	1
8	JCE1612	Water and WasteWater Analysis Laboratory	PC	4	0	0	4	2
9	JPT1002	Technical Skills andAptitude II	EEC	2	0	0	2	1
TOTAL				**27**	**7**	**2**	**8**	**22**

SEMESTER – 7

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCE1701	Estimation and Quantity Surveying	PC	4	2	2	0	3
2	JCE1702	Geospatial Technology andits Applications	PC	3	3	0	0	3
3		Professional Elective 4	PE	3	3	0	0	3
4		Professional Elective 5	PE	3	3	0	0	3
5		Open Elective 4	OE	3	3	0	0	3
6	JNC1361	Essence of Indian Traditional Knowledge	NCM	3	3	0	0	0
PRACTICALS								
7	JBA1711	Entrepreneurship for Engineers	EEC	2	0	0	2	1
8	JCE1711	Computer Aided Analysisand Design Laboratory	PC	4	0	0	4	2
9	JCE1731	ProjectWork–Phase1	EEC	6	0	0	6	3
10	JCE1741	Internship	EEC	-	-	-	2**	1
			TOTAL	**31**	**17**	**2**	**14**	**22**

** Internship of two weeks must be undertaken in Industry through semesters 4,5,6 leading to award of 1 credit in Semester 7

SEMESTER-8

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JNC1861	Indian Constitution	NCM	3	3	0	0	-
PRACTICALS								
2	JCE1811	Comprehensive and Technical Seminar	EEC	2	0	0	2	1
3	JCE1841	Project Work - Phase 2	EEC	18	0	0	18	9
			TOTAL	**23**	**3**	**0**	**20**	**10**

OPEN ELECTIVES-2

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCE9004	Air Pollution	OE	3	3	0	0	3
2	JCE9005	Global ClimateChange and its Impact	OE	3	3	0	0	3
3	JCE9006	Sustainable UrbanPlanning	OE	3	3	0	0	3

OPEN ELECTIVES- 3

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCE9007	Smart Building Systems	OE	3	3	0	0	3
2	JCE9008	Renewable Energy	OE	3	3	0	0	3
3	JCE9009	Green Building	OE	3	3	0	0	3

OPEN ELECTIVES-4

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCE9010	Testing of Materials	OE	3	3	0	0	3
2	JCE9011	Environmental Legislations In Industries	OE	3	3	0	0	3
3	JCE9012	Building Services	OE	3	3	0	0	3

SEMESTER I

JHS1121	COMMUNICATIVE ENGLISH & SOFT SKILLS I	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To enable the students of Engineering and Technology to develop their listening skill by learning the key techniques for compare ending information.
- To facilitate the learners to speak effectively while exchanging ideas in academic and social domains.
- To develop their skills in reading and understanding texts through practice.
- To expose them to the correct usage of language to develop their writing skill.
- To train the students to use appropriate vocabulary in academic and technical writings.

UNIT I BASIC GRAMMAR I AND READING FOR INFORMATION 9

Parts of speech - Sentence patterns – Tenses –Wh- questions - Yes/no questions – Countable and Uncountable nouns-Affixation–word formation; Reading short comprehension passages - practice in skimming and scanning for specific information and note-making, Critical reading - finding key information in a given text - shifting facts from opinions and paraphrasing

SOFT SKILLS LAB 3

Listening to documentaries, inspiring speeches of great leaders, news bulletins, Ted talks, telephonic conversations

UNIT II BASIC GRAMMAR I AND SHARING INFORMATION 9

Pronouns - Adjectives - Adverbs - Imperatives - Direct and indirect questions – Compound words - Guessing meaning of words in contexts – one word substitutes; Autobiographical writing (writing about one's leisure time activities, home town, favourite place and school life)–Biographical writing (place, people), Letter writing (informal letters)

SOFT SKILLS LAB 3

Self-introduction, peer introduction, pictured Description, JAM

UNIT III BASIC GRAMMAR III AND FREE WRITING I 9

Conjunctions–Prepositions-Articles-Degrees of comparison–Discourse markers-Reference words; Process description, Coherence and cohesion in writing cause and effect /compare &contrast /narrative / analytical paragraphs

SOFT SKILLS LAB 3

Language functions: Giving reasons, talking about future plans, comparing and contrasting, making suggestions

UNITIV BASIC GRAMMARIV AND LANGUAGE DEVELOPMENT 9

Subject-verb agreement - Modal verbs - Phrasal verbs - Single word substitutes - Use of abbreviations & acronyms- Cloze reading – Interpreting visual material, Jumbled sentences

SOFT SKILLS LAB 3

Inter personal Skills: role play, group discussion, debate, conduct of meeting

UNIT V BASIC GRAMMAR V AND FREE WRITING II 9

Clause - Direct and indirect speech – Correction of errors - Word association (connotations) - Lexical items (fixed / semi fixed expressions) - Essay writing – different types of essays, dialogue writing

SOFT SKILLS LAB **3**

Creative writing and speaking skills: Poster making and description, project proposals

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to;

- Listen to different talks and lectures and understand them easily.
- Communicate their thoughts confidently using communicative Strategies.
- Read and grasp different genres of texts effortlessly.
- Write grammatically correct academic, business and technical texts.
- Apply the language skills efficiently in all forms of communication.

TEXTBOOKS:

1. Board of Editors, Department of English, Anna University, Chennai. Using English: A Course Book for Undergraduate Engineers and Technologists, Orient Black Swan: Chennai,2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.

REFERENCE BOOKS:

1. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: English Skills for Engineers. Oxford University Press, New Delhi.2011.
2. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006
3. Rizvi M, Ashraf. Effective Technical Communication. Tata McGraw-Hill Publishing Company Limited, New Delhi,2007.
4. Rutherford, AndreaJ. Basic Communication Skills for Technology. Pearson Edition (I IEdition), New Delhi, 2001.

REFERENCE BOOKS FOR SOFTSKILLS LAB–I:

1. Mandel, Steve. Effective Presentation Skills. New Delhi: Viva Books Pvt.Ltd.,2004.
2. Kilmet, Stephen."The Resume and" The Computerized Resume. "In Writing for Design Professionals.
3. Writing Cover Letters-Kilmet, Stephen ."Cover Letter, "and" Enclosures and Attachments. "In Writing for Design Professionals. New York
4. Writing a Proposal "Standard Proposal for Funding." In Writing in the Disciplines. Fort

EXTENSIVE READING:

- Kalam, Abdul. The Wings of Fire, Universities Press, Hyderabad. 1999

MAPPING OF CO's-PO's

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12
CO1	0	0	1	1	0	2	1	0	1	2	1	2
CO2	0	0	2	1	1	1	2	0	0	3	1	2
CO3	0	0	1	1	1	2	1	0	0	3	1	2
CO4	0	0	1	1	0	1	1	0	1	3	1	2
CO5	0	0	1	0	0	1	2	0	2	3	1	2
AVG	0	0	1	1	1	1	1	0	1	3	1	2

JMA1101	MATRICES AND CALCULUS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the knowledge of matrices required for applications in engineering.
- To enable students to understand the concepts of multivariable functions and its calculus.
- To familiarize students on concepts of differential calculus and its applications.
- To introduce concepts of integral calculus as tools required for applications in engineering.
- To introduce ordinary differential equations which is widely used in problem solving and engineering applications.

UNIT I MATRICES 12

Eigen values and Eigen vectors of a real matrix–Characteristic equation –Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem – Diagonalization of matrices by similarity and orthogonal transformations–Reduction of aquadratic form to canonical form–Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Total derivative – Jacobians – Taylor's series for functions of two variables –Maxima and minima of functions of two variables–Lagrange's method of un determined multipliers.

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS 12

Curvature and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV APPLICATIONS OF INTEGRAL CALCULUS 12

Multiple integrals: Double integrals – Change of order of integration – Change of variables – Area enclosed by plane curves–Triple integrals–Volume of solids.
Improper integrals: Beta and Gamma Integrals–Definitions and properties–Simple problems.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Method of undetermined coefficients - Homogeneous equation of Euler's and Legend re's type–System of simultaneous first order linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able;

CO1: To understand applications of matrix theory in quadratic forms.

CO2: To use calculus for problems and applications dealing with functions of Several variables.

CO3: To apply differential calculus in practical problem solving in the area of geometry.

CO4: To gain insight on the applications of multiple integrals in area and volume problems.

CO5: To solve ordinary differential equations that occur in many physical and engineering applications.

TEXT BOOKS:

1. Grewal B.S.,"Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, NewDelhi, 2016.
3. P.Anuradha and V.Sudhakar, "Matrices and Calculus", Scitech Publications, 1st Edition, Chennai, 2019.

REFERENCES:

1. Anton, H,Bivens, I and Davis,S,"Calculus",Wiley,10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics" ,Narosa Publications, New Delhi,3rd Edition,2007.
3. Srimantha Paland Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
4. Weir, M.DandJoelHass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

WEB REFERENCES:

1. https://nptel.ac.in/courses/111/108/111108157/
2. https://nptel.ac.in/courses/111/107/111107108/
3. https://nptel.ac.in/courses/111/104/111104144/
4. https://nptel.ac.in/courses/111/105/111105122/
5. https://nptel.ac.in/courses/111/107/111107111/

MAPPING OF CO's-PO's

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO1 2
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JPH1101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable the students to understand the basic soft helatest advancements in Physics.
- To introduce the principles of quantum mechanics.
- To impart knowledge of laser and fiber optic communication.

UNIT I CRYSTAL PHYSICS 9

Single crystal, Polycrystal and Amorphous materials – Single Crystals: Unit cell, Crystal systems, Bravais lattices, Directions and Planes in a crystal, Miller indices – Inter planar distances – Co ordination number and Packing factor for SC, BCC, FCC, HCP and Diamond structures - Crystal imperfections: Point defects, Line defects – Burgers vector, Stacking faults.

UNIT II PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic moduli and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment-bending of beams-stress due to bending in beams-bending moment–cantil ever: theory and experiment–uniform and non-uniform bending: theory and experiment**.**

UNIT III ULTRASONICS 9

Production of ultrasound by Magneto striction effect and Piezo electric effect Detection of ultrasonic wave – Properties of ultrasonic wave – Acoustic grating - Industrial applications – Drilling, Welding, Soldering and Cleaning – SONAR - Non Destructive Testing – Pulse echo system through Transmission and Reflection modes- A, B and C–scan displays.

UNIT IV PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission-Population inversion -Einstein's A and B coefficients derivation – Laser Principle - Semiconductor lasers (homojunction & heterojunction)- Optical Fiber: types (material, refractive index, mode) - Propagation of light in optical fibers – Numerical aperture and Acceptance angle –attenuation, dispersion, bending -Fiber Optical Communication system (Block diagram) -Active and passive fiber sensors-Endoscope.

UNIT V QUANTUM PHYSICS 9

Black body radiation –Planck's theory (derivation) –Deduction of Wien's displacement law and Rayleigh –Jeans' Law from Planck's theory –Compton effect-theory –Properties of Matter waves –G.P Thomson experiment -Schrödinger's wave equation –Time independent and time dependent equations –Physical significance of wave function –Particle in a one dimensional box -Scanning electron microscope -Transmission electron microscope.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able;

- To enhance knowledge on properties of matter.
- To assess the properties of ultra sonics and imaging devices.
- To understand and to compute problems in Quantum Physics.
- To learn the use of modern optical fiber communication systems and tools in real life applications.
- To gain more in sight on the functioning of optical materials for opto electronics.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015
2. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015
3. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
4. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
5. Dr.Beula Shanthi John, Dr.P.mani," Engineering Physics",Dhanam Publications,First Edition, 2019

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. &Mosca, G. "Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.
4. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
5. John D.Cutnell, "Cutnell and Johnson Physics", Willey Publications, 2018.

WEB SITE REFERENCES:

1. https://nptel.ac.in/courses/115/104/115104109/
2. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce18/
3. https://onlinecourses.nptel.ac.in/noc21bt50/preview
4. https://nptel.ac.in/courses/115/104/115104096/
5. https://nptel.ac.in/courses/108/104/108104113/

MAPPING OF CO's-PO's

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

JCY1101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To acquaint the student with concepts of photo chemistry and analytical techniques.
- To make the students conversant with boiler feed water and water treatment techniques.
- To make the students acquire sound knowledge in corrosion of materials.
- To understand polymer chemistry and the principle of energy in batteries.
- To impart knowledge on the basics of nano materials and engineering materials.

UNIT I PHOTO CHEMISTRY AND ANALYTICAL TECHNIQUES 9

Photochemistry- Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law (problems). Photo processes - Internal Conversion, Inter-system crossing, Fluorescence and its applications in medicine – Phosphorescence-Chemilumine science and Photo-sensitization. Analytical Techniques–UV-visible spectroscopy– principles– instrumentation (block diagram only) – Colorimetry- Principle-Instrumentation, estimation of iron by colorimetry – Flame photometry – principle – Instrumentation – estimation of sodium by Flame photometry.

UNIT II WATER TECHNOLOGY 9

Hardness-Units of Hardness- Temporary hardness-Permanent hardness- Estimation hardness by EDTA method- Alkalinity – Types- water quality parameters (pH, EC, TDS, DO, BOD,COD) - Boiler feed water-requirements-boiler troubles (scale and sludge-caustic embrittlement-boiler corrosion-priming and foaming)-softening of hard water-external treatment (zeolite and demineralization) - internal treatment (phosphate, calgon, carbonate, colloidal) – desalination of brackish water–reverse osmosis.

UNIT III ELECTRO CHEMISTRY AND CORROSION 9

Electrochemistry-Electrochemical cell-redox reaction, electrode potential-oxidation potential-reduction potential, measurement and applications-electro chemical series and its significance- Nernst equation (derivation and problems).Corrosion- causes- types-chemical, electrochemical corrosion- galvanic corrosion-differential aeration corrosion (pitting, waterline, wire fence, pipeline, crevice, stress corrosion), Factors influencing the rate of corrosion- corrosion control - material selection and design aspects –cathodic protection methods (sacrificial anode and impressed current cathodic methods)-Electro plating of Copper and electroless plating of nickel-corrosion inhibitors (anodic and cathodic inhibitors).

UNIT IV POLYMER, COMPOSITES AND ENERGY STORAGE DEVICES 9

Introduction-Classification of polymers–Natural and synthetic; Thermo plastic and Thermosetting. Functionality – Degree of polymerization. Bio degradable polymer-Types-synthetic methods–applications of bio degradable polymers. Polymer composites and its application.

Energy Storage Devices - Batteries and fuel cells: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, nickel-cadmium battery, lithium-ion-battery).Fuelcell–H_2-O_2 fuel cell-solid oxide fuel cell-polymer electrolyte membrane fuel cell(PEMFC) applications.

UNIT V ENGINEERING MATERIALS AND NANO CHEMISTRY 9

Engineering Materials- Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks. cement- manufacture and properties - setting and hardening of cement, special cement- water proof and white cement– properties and uses. Nano chemistry–Introduction–distinction between molecules, nanoparticles and bulk materials; Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electro deposition, chemical vapour deposition, laser ablation; Properties and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able;

- Students understood topics like fluorescence/phosphorescence and their mechanism, laws of photo chemistry. From instrumental techniques students understood about their principles and applications in various fields.
- To understand the basic principle of water treatment and techniques involved in purification process for future learning.
- Based on electrochemical reactions, students understood the corrosion of materials, control and prevention methods.
- The knowledge gained on polymer chemistry will help the students to differentiate the type so f polymers and polymerization reactions. Preparative methods of some biodegradable polymers and their applications are clearly understood. Understanding principle of batteries, its uses and different types of nonconventional energy resources will give an idea and development of new energy resources.
- The knowledge gained on engineering materials will facilitate better understanding of engineering processes and applications for further learning. Students understood about the unique behavior of nano materials from its bulk materials, also understood about various synthetic methods of nano materials and their applications.

TEXTBOOKS:

1.JainP.C.and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., NewDelhi, 2010.

2.R.Gopalan, D.Venkapayya, Sulochna Nagarajan, Text book of Engineering Chemsitry, Vikas publishing pvt ltd, 4th edition, 2013.

3. Dr.N.John Jebarathinam Dr.R.Vaidyanathan Ms.A.U.Ajisha Dr.A.Ravikrishnan, Engineering Chemistry, Sri Krishna Publications, First edition 2019.

REFERENCES:

1. K.Sesha Maheswaramma, Mridula Chugh, Engineering chemistry, Pearson, 2016.
2. O.G.Palanna, Engineering Chemistry, McGraw Hill, 2017
3. Dara S.S, UmareS.S, "Engineering Chemistry", S.Chand & Company Ltd., NewDelhi 2013.
4. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., NewDelhi, 2008.
5. GowarikerV.R.,Viswanathan N.V.and Jayadev Sreedhar, "Polymer Science",NewAge International P (Ltd.,), Chennai, 2006.
6. OzinG.A. and Arsenault A.C.,"Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
7. B.R.Puri, L.R.Sharma, Madan S.Pathana, Principle of physical chemistry, 47th edition, Vishal publishing Co, 2017.

MAPPING OF CO's-PO's

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO1 2
CO1	2	2	-	-	-	1	-	-	-	-	-	-
CO2	2	2	-	-	1	-	-	-	-	-	-	1
CO3	2	2	-	-	1	-	-	-	-	-	-	1
CO4	2	2	2	-	-	-	-	-	-	-	-	1
CO5	2	2	2	-	-	-	-	-	-	-	-	1
AVG	2	2	2	-	1	1	-	-	-	-	-	1

JGE1101	ENGINEERING BASICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

To impart knowledge on the

- Basics of Civil Engineering to the students.
- Basics of Mechanical Engineering to the students.
- Electric circuits and working principles of Electrical Machines.
- Principles and characteristics of various electronic devices.
- Basics of various measuring instruments.

UNIT I BASICS OF CIVIL ENGINEERING 11

Introduction to Civil Engineering, Types of buildings, Components of a residential building, Building Materials, Types of slabs, beam, column, lintel, floor and foundation - Types of roofs. Surveying and Levelling - Linear and Angular Measurements - Introduction to transport system, role of transportation in society - Green Highway. Sources of water, Hydrological cycle, Irrigation Engineering, Rain water harvesting, Environmental pollution, Greenhouse gas emission, Ozone depletion, Global warming - Green building concepts.

UNIT II BASICS OF MECHANICAL ENGINEERING 11

Introduction to the concepts of Mechanization and Automation, Robotics – Manufacturing methods - casting, machining, forming operations, Introduction to IC Engine - Working principles of four stroke petrol and diesel engines, Types of power plants - Hydel power plant and thermal power plant, Steam generators - Fire tube boiler and water tube boiler, Thermal systems - Heat exchangers, Radiator and oil cooler, Design of ingenious mechanisms - Parts feeding mechanism.

UNIT III ELECTRIC CIRCUITS AND ELECTRICAL MACHINES 7

Basic circuit components – Ohms Law – Kirchhoff's Law-Introduction to AC circuits – waveforms and RMS value–power and power factor-Principles of operation and characteristics of DC machines-Transformers-three phase and single-phase induction motors.

UNIT IV ELECTRONIC DEVICES &CIRCUITS 7

Types of Materials - Silicon & Germanium - N type and P type materials - Construction and Characteristics: PN Junction diode - Zener Diode - Bipolar Junction Transistor - Field effect Transistors - IGBT - Introduction to operational amplifier - Inverting Amplifier - Non-inverting Amplifier

UNIT V MEASUREMENTS & INSTRUMENTATION 9

Elements of generalized measurement system – Basic terminologies: Accuracy, precision, resolution, sensitivity, linearity, span and range – Errors in measurement– Standards of measurement - calibration – Operating forces: Deflection force, controlling force, damping force-Classification of instruments.

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

- Gain knowledge on the various fields of Civil Engineering.
- Know the fundamentals of Mechanical Engineering.
- Understand the basic concepts of electric circuits and working principles of electrical machines.
- Gain knowledge on the basics of electronics and apply them in practical situations.
- Choose appropriate instruments for electrical measurement for a specific application.

TEXTBOOKS

1. Shanmugam G and Palanichamy M S, "Basic civil and mechanical Engineering", Tata Mc Graw Hill publishing Co.,2016
2. DP Kothari and I.J Nagarath, Electrical Machines―Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint, 2016.

REFERENCES:

1. Thereja.B.L.,―Fundamentals of Electrical Engineering and Electronics‖, S.Chand & Co.Ltd., 2008.
2. A.K. Sawhney, A Course in Electrical &Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2010.
3. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill, NewDelhi,2010.

JGE1102	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn Fundamentals of computing.
- To be able to use file operations in C.
- To implement programs using basic features of C.
- To learn to use C pointers and dynamically allocated memory techniques.
- To learn advanced features of the C programming Language.

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Simple model of a Computer – Hardware – Software – Data Representation, Problem Solving Techniques–Bottom up design and top down design-applications, Introduction to Algorithms and Flow Chart - Notion of memory, addresses, variables, instructions, execution of instructions. Operating system commands, file editing, compiling, linking, executing a program.

UNIT II C PROGRAMMING BASICS 9

Introduction to 'C' programming – structure of a 'C' program – compilation and linking processes. Conversion of simple algorithm to program-Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching–Looping statements–solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - String- String operations –Arrays of strings.

UNIT IV FUNCTIONS AND USER DEFINED DATA TYPES 9

Function–definition of function–Declaration of function–Pass by value-Pass by reference–Command Line Argument in C-Recursion-Enumerators-Structures- Unions.

UNIT V POINTERS AND FILES 9

Macros - storage classes - Pointers- Definition – Initialization – Pointers arithmetic – Double Pointers, Basic file operations-Example problems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to;

- Design and represent solutions to problems as algorithm and flow chart.
- Write simple C Programs using loops and conditional statements.
- Writes simple C Programs using arrays.
- Write simple C Programs using functions.
- Write simple C codes using pointers, structures and union.

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018.
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, McGraw- Hill, 2010.
3. Brian W. Kernighan and Rob Pike, "The Practice of Programming" (Chap 1), Pearson Education, 2008

REFERENCES:

1. Kernighan, B.Wand Ritchie, D.M, "The C Programming language", Second Edition, PearsonEducation, 2015.
2. Yashavant P.Kanetkar."Let Us C", BPB Publications, 16th edition SS2017.
3. Paul J Deitel, Dr.Harvey M.Deitel, "C How to Program", Seventh Edition, Pearson Education, 2016.
4. E.Balagurusamy, "Computing Fundamentals and C Programming", McGraw-Hill Publishing Company Limited, (2017).

JPC1111	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

PHYSICS LABORATORY

COURSE OBJECTIVES:

- To provide students the first hand experience of verifying various concepts learnt in theory courses.

LIST OF EXPERIMENTS:

1. Determination of Young's modulus for the given uniform bar by uniform bending method.
2. Determination of wavelength of the diode laser and hence determine thesize of the coated powder particle.
3. Determination of velocity of Ultra sound using Ultrasonic interferometer and also find the compressibility of the given liquid.
4. Determination of moment of inertia of the given circular disc and rigiditymodulus of the metal wire using torsional pendulum.
5. Determination of Planck' constant using different color filters.
6. Determination of Wavelength of spectral lines in mercury spectrum using spectrometer.
7. Analysis of I-V Characterization of Solar cell.

TOTAL: 15 PERIODS

CHEMISTRY LABORATORY LIST OF EXPERIMENTS

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
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. Estimation of copper in brass by Iodometry.
6. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to;

1. Acquire experience in analyzing the elastic materials.
2. Understand the acoustic properties of various liquids.
3. Acquire knowledge in optical properties of solids.
4. Make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
5. Acquaint the students with the determination of molecular weight of a polymer by viscometry.

REFERENCES:

1. Practical Fiber Optics, D.Bailey and E.Wright, 2003
2. J.Mendham, RC Denney, JD Barnes, MJK Thomas, Text book of quantitativechemical analysis, Vogel's, 2008.

MAPPING OF CO's-PO's

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

JGE1111	DESIGN APPRECIATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various
- Basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To kind leown creativity, ideation and realize the importance of team working.
- To gain knowledge through experience in handling of engineering aggregates.
- To appreciate the use of various mechanisms involved in engineering products.
- To understand the interactions between its sub systems and their functionality.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE BUILDINGS: 13

Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

PLUMBING WORKS:

a) Study of pipe line joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in house hold fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
d) Hands-on-exercise: Basic pipe connections–Mixed pipe material connection– Pipe connections with different joining components.
e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY:

a) Study of the joints in roofs, doors, windows and furniture.
b) Hands-on-exercise: Woodwork, joints by sawing, planning and cutting.

II MECHANICAL ENGINEERING PRACTICE WELDING: 18

a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.
b) Gas welding practice

BASIC MACHINING:

a) Simple Turning and Taper turning
b) Drilling Practice

SHEET METAL WORK:

a) Forming & Bending:
b) Model making–Trays and funnels.
c) Different type of joints.

MACHINE ASSEMBLY PRACTICE:

a) Study of Centrifugal pump
b) Study of Air conditioner

DEMONSTRATION ON:

a) Smithy operations, upsetting, swaging, setting down and bending. Example– Exercise–Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step conepulley.
c) Fitting–Exercises–Preparation of square fitting and V–fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

II ELECTRICAL ENGINEERING PRACTICE 13

a) Residential house wiring using switches, fuse, indicator, lamp and energy meter.
b) Fluorescent lamp wiring.
c) Staircase wiring
d) Measurement of electrical quantities–voltage, current, power & power factor in RLC circuit.
e) Measurement of energy using single phase energy meter.
f) Measurement of resistance to earth of electrical equipment.

III ELECTRONICS ENGINEERING PRACTICE 16

a) Study of Electronic components and equipments–Resistor, capacitor and inductor-colour coding.
b) Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
c) Study of logic gates AND, OR, NOT, NAND, NOR, EX-OR and EX-NOR.
d) Generation of Clock Signal.
e) Soldering practice –Components Devices and Circuits –Using general purpose PCB.
f) Measurement of ripple factor of HWR and FWR

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Fabricate carpentry components and pipe connections including plumbing works.
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: 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 Standard woodworking tools 15 Sets
3. Models of industrial trusses, door joints, furniture joints 5each
4. Power Tools:
   (a) Rotary Hammer 2 Nos
   (b) Demolition Hammer 2Nos
   (c) Circular Saw 2Nos
   (d) Planer 2 Nos
   (e) Hand Drilling Machine 2 Nos
   (f) Jigsaw 2Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5Nos
2. Welding booth with exhaust facility 5Nos
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 2Sets
7. Moulding table, foundry tools 2 Sets
8. Power Tool: Angle Grinder 2Nos
9. Study-purpose items: centrifugal pump, air-conditioner 1each

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1each
4. Megger (250V/500V) 1No
5. Power Tools:

(a) Range Finder 2Nos
(b) Digital Live-wire detector 2 Nos

ELECTRONICS

1. Soldering guns 10Nos
2. Assorted electronic components for making circuits 50 Nos
3. Small PCBs 10 Nos
4. Multi meters 10 Nos
5. Study purpose items: Telephone, FM radio, low-voltage power supply

Web site References:

1. www.vikaspublishing.com/engineering-practices-lab
2. https://archieve.org/mechanicalengineeeringworkshoplaboratory

JGE1112	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To be exposed to the syntax of C
- To be familiar with programming in C
- To learn to use arrays, strings, functions, pointers, structures and unions in C.
- To Learn the fundamentals of File Programming in C
- To solve simple problems using

LIST OF EXERCISES:

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files

TOTAL: 60 PERIODS

COURSE OUTCOMES

At the end of the course, the student should be able to:

- Write simple C Programs
- Able to solve scientific problems using C
- Gain knowledge on the use of functions and arrays
- Use structures, pointers and files in C Programs
- Develop modularized applications in C

TEXT BOOKS:

1. Pradip Dey, Manas Ghosh, "Programming in C - As per the latest AICTE syllabus", First Edition, Oxford University Press,2018
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, McGraw- Hill,2010

REFERENCES:

1.Yashavant P. Kanetkar. "Let Us C", BPB Publications,16th edition 2017.

WEB SITE REFERENCE

1.https://www.geeksforgeeks.org/

SEMESTER II

JHS1221	TECHNICAL ENGLISH & SOFT SKILLS II	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To make the students of engineering and technology enhance their ability to read and comprehend different texts.
- To improve their creative and critical thinking so as to use in demanding contexts.
- To equip the learners with the skills of writing convincing job applications and effective reports.
- To develop their speaking skills to make technical presentations and participate in group discussions.
- To facilitate them to hone their soft skills.

UNIT I TECHNICAL WRITING AND VISUAL CONVERSION 9

Definitions, Purpose statements, Technical vocabulary, regular and irregular verbs – Process Description and Interpretation of Graphs and Charts.

SOFTS KILLS LAB 3

Skimming and scanning, understanding logic and sequencing in reading, inferring the exact meaning of text, making out meaning of pictorial and graphical representations.

UNIT II TECHNICAL WRITING AND GUIDELINES PREPARATION 9

Conditional clauses, Numerical adjectives, Collocation, verbal analogies-Instructions, Recommendations, Checklist.

SOFTS KILLS LAB 3

Comprehensive listening: Listening to telephonic conversations, listening to native accents, short and long conversations from different domains, listening to various pre-recorded conversations and speeches.

UNIT III SOFT SKILLS LAB 12

Listening and speaking practice based on BEC, IELTS and TOEFL.

UNIT IV TECHNICAL WRITING AND BUSINES SLETTERS 9

Cause and effect, impersonal passive voice, idioms and phrases, words used as nouns and verbs-Letter writing–job application, business correspondence (letters) –calling for quotations, placing order, complaint letters, preparing a memo, notice and e-mail–itinerary.

SOFT SKILLS LAB 3

Group Discussions - Process, Skills, Guidelines, Evaluation, Oral Presentation – Planning, Preparing, Organizing, Presenting.

UNIT V TECHNICAL WRITING AND REPORT WRITING 9

Degrees of comparison, editing, Email etiquette, Misspelled words-Report writing: survey, feasibility, industrial visit, reporting various incidents and accidents, Minutes of meeting.

SOFT SKILLS LAB **3**

Starting a Career–vision statement, preparing logo and tag line, making short term and long term goals, setting plans

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Read and understand general and technical texts
- Apply creative and critical thinking and communicate their ideas efficiently
- Participate in group discussions and deliver short speeches effectively
- Write effectively and persuasively in academic and work place contexts
- Face the future challenges confidently and successfully

TEXTBOOKS:

1. Department of English, Anna University, Chennai. Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai.
2. Dhanavel, S.P English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.

REFERENCE BOOKS:

1. Rizvi, M.Ashraf, "Effective Technical Communication" ,Tata McGraw–Hill, 2006.
2. Ibbotson, Mark, "Cambridge English for Engineering", Cambridge University Reference Press, 2008
3. Richard Johnson- Sheehan, "Technical Communication Today" 4th Edition Books Long man Publishing Group, 2011.
4. Kenton, Sharon & Deborah Valentine, "Cross Talk: Communicating in a Multi cultural Work place", Prentice Hall, 1996.
5. English, Laura M & Sarah Lynn, "Business Across Cultures: Effective Communication Strategies", Addison Wesley, 1995.

REFERENCE BOOKS FOR SOFT SKILLS LAB–II:

1. Richard Johnson-Sheehan, "Technical Communication Today" 4th Edition Books Longman Publishing Group, 2011
2. Porter, Patricia A. and Margaret Grant, "Communicating Effectively in English: Oral Communication for Non-Native Speakers", 2nd Edition,Wadsworth, 1992.
3. Alley, Michael, "The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid", 1st Edition, Springer, 2007.
4. Gopalaswamy, Ramesh & Ramesh Mahadevan. ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson, 2010.

EXTENSIVE READING:

- Wells, H.G. The Time Machine, Peacock, India,2008.

MAPPING OF CO's-PO's

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CO1	0	0	1	1	0	2	1	0	1	2	1	2
CO2	0	0	2	1	1	1	2	0	0	3	1	2
CO3	0	0	1	1	1	2	1	0	0	3	1	2
CO4	0	0	1	1	0	1	1	0	1	3	1	2
CO5	0	0	1	0	0	1	2	0	2	3	1	2
AVG	0	0	1	1	1	1	1	0	1	3	1	2

JMA1201	VECTOR CALCULUS AND COMPLEX ANALYSIS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To familiarize students on concepts of vector calculus and complex analysis in problem solving.
- To build concepts of Laplace transforms leading up to its applications on solving differential equations

UNIT I VECTOR CALCULUS 12

Vector Differentiation: Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields Vector Integration: Line and surface integrals - Green's theorem – Gauss and Stoke's theorems – Verification and evaluation in simple problems.

UNIT II ANALYTIC FUNCTIONS 12

Analytic functions – Zeros and Singularities-Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates (without proof) - Properties– Harmonic conjugates–Construction of analytic functions – Conformal mappings–

UNIT III COMPLEX INTEGRATION 12

Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series -Types of Singularities and residues – Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals (Circular contour and semi-circular contour only).

UNIT IV LAPLACE TRANSFORMS 12

Definition - Existence conditions – Transforms of elementary functions – Transforms of unit step function and unit impulse function – Properties with proof – Initial and final value theorems–Transform of periodic functions–Convolution theorem with proof– Problems.

UNIT V INVERSE LAPLACE TRANSFORMS 12

Definition - Evaluation of Inverse Laplace transforms by using properties, partial fractions, residues and convolution theorem - Applications to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To understand concepts of vector calculus and evaluate line and surface integrals
- To understand analyticity of complex valued functions, bilinear transformation and conformal mappings
- To evaluate complex integrals using Cauchy' s integral and Cauchy's residue theorems
- To find Laplace transforms of functions using definition and properties
- To apply Laplace transform method in solving differential equations

TEXT BOOKS:

1. Grewal B.S.,"Higher Engineering Mathematics", Khanna Publishers, NewDelhi, 43rd Edition, 2014.
2. KreyszigErwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, NewDelhi, 2016.
3. P.Anuradha and V.Sudhakar, "Vector Calculus and Complex Analysis", Scitech Publications, 1stEdition, Chennai, 2019.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O'Neil, P.V., "Advanced Engineering Mathematics", Cengage Learning India Pvt Ltd, New Delhi, 2007.
4. Sastry, S.S, Engineering Mathematics", Vol.I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

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CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JBE1222	APPLIED SCIENCE FOR CIVIL ENGINEERING	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To introduce the principles of thermal performance in building.
- To introduce the principles of acoustics effect in building.
- To introduce the principles of optics and new materials for civil engineering applications.
- To understand the basic concepts of adsorption and water treatment by advanced techniques.
- To understand about the principles in various analytical techniques.

UNIT I THERMAL PERFORMANCE OF BUILDINGS 7

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, Climate and Design of solar radiation, Shading devices- Central heating.

UNIT II ACOUSTICS 7

Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- Derivation using Growth and Decay method – Absorption Coefficient and its Determination –Factors affecting Acoustics of buildings and their remedies. Methods of sound absorptions – absorbing materials - Noise and its measurements.

UNIT III LIGHTING DESIGNS 7

Radiation quantities – Spectral quantities – Relationship between Luminescence and Radiant quantities – Hemispherical reflectance and transmittance –Photometry: Cosine law, Inverse square law. Vision – photopic, mesopic, scotopic visions. Color – luminous efficiency function - Visual field glare, Color - Day light calculations.

UNIT IV ADSORPTION AND WASTE WATER TREATMENT (AOP) 10

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions– adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm - applications of adsorption on pollution abatement. Advanced Oxidation Process- Theory of AOP- Methods to produce hydroxyl radicals ($HO^{\cdot}$) – Ozone/UV, ozone/hydrogen peroxide, Hydrogen peroxide/UV- Applications of AOP.

UNIT V INSTRUMENTAL METHODS OF ANALYSIS 9

Thermal analysis techniques- Thermo gravimetric analysis and Differential thermal analysis- Principle, instrumentation and applications: Concepts of chromatography – principle, instrumentation and applications of Paper chromatography, Column chromatography, Thin layer chromatography and Gas chromatography. Principle and applications of Conductometric titrations, Potentiometric titrations and pH-metry.

PHYSICSLABORATORY

LIST OF EXPERIMENTS: (ANY 5)

1. Determination of dispersive power of the given solid prism using spectrometer
2. Determination of thickness of the given thin material by forming interference fringes using air-wedge setup
3. Analysis of I-V Characterization of Solar cell
4. Determination of energy gap of the given semi conductor by plotting the graph between current and temperature
5. Determination of acceptance angle of the given fiber cable.
6. Determination of Young' s modulus for the given uniform bar by non- uniform bending method

CHEMISTRY LABORATORY LIST OFEXPERIMENTS (ANY 5)

1. Determination of strength of hydro chloric acid using Ph meter.
2. Determination of strength of acids in a mixture of acids using conductivity meter.
3. Conductometric titration of strong acid vs strong base.
4. Estimation of iron content using potentiometer.
5. Estimation of iron content of the water sample using spectrophotometer (thiocyanate method).
6. Estimation of sodium and potassium present in water using flame photometer.
7. Determination of SAP and FAV values of an oil.
8. Estimation of acetic acid adsorbed on charcoal

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will able to

- Acquire knowledge on the thermal performance of buildings.
- Get knowledge on the acoustic properties of buildings.
- Acquire knowledge on various lighting designs for buildings
- Acquainted with hands-on knowledge in the quantitative chemical analysis through instrumental analysis
- Acquire practical knowledge on interference pattern, semiconductor devices, solar cells and instrumental analysis of acids, base sand heavy metals.

TEXT BOOKS:

1. Budinski, K.G.& Budinski, M.K."Engineering Materials Properties and Selection", Prentice Hall, 2009.
2. Severns,W.H.& Fellows, J.R."Air conditioning and Refrigeration", John Wiley and Sons, London, 1988.
3. Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press,2013.
4. Jain P.C.and MonicaJain,"Engineering Chemistry",Dhanpat Rai Publishing Company (P) Ltd., NewDelhi, 2010.

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1. Gaur R.K.and Gupta S.L.,Engineering Physics. Dhanpat Rai publishers, 2012.
2. K.Sesha Maheswaramma, Mridula Chugh, Engineering chemistry, Pearson, 2016.
3. O.G.Palanna, Engineering Chemistry, McGraw Hill, 2017.
4. Gurdeep R.Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 2007.
5. Metcalf & Eddy, Waste water Engineering Treatment of Reuse, Tata McGraw-Hill, 2003.
6. Practical Fiber Optics, D.Bailey and E.Wright, 2003
7. J.Mendham, RCDenney, JD Barnes, MJK Thomas, Text book of quantitative chemicalanalysis, Vogel's, 2008.
8. Quantitative and qualitative analysis, U.Alexeyer, MIR publication, Moscow (1979).
9. Analytical Chemistry, Gary D. Christian, Wiley, 2005.

MAPPING OF CO's-PO's

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

JGE1201	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide an introduction to Python Programming Language.
- To understand the decision making and looping concepts.
- To understand functions, strings and list in Python.
- To understand tuples, dictionaries and files.
- To know the exception handling and 2D concepts.

UNIT I INTRODUCTION TO PYTHON 9

History of Python, Features, Installing Python, Running Python Program, Interactive mode programming, Script Mode Programming, Identifiers, Reserved Words, Indentation, Comments, Variables, Data Types, Data Type Conversion.

UNIT II DECISION MAKING AND LOOPING 9

Python Operators, Operator Precedence, Decision Making: if Statement, if else Statement, if elif else Statement, nested if Statement, Loops: while loop, for loop, nested loops; Loop Control Statements: continue Statement, break Statement, pass Statement: Iterator and Generator

UNIT III FUNCTIONS, STRING, LIST 9

Functions: Pre defined Functions, User defined Functions, Recursion, Lambda Function; String: Functions, methods, modules; Lists: Operations, pre-defined functions, advanced list processing; Packages

UNIT IV TUPLES, DICTIONARY, FILES 9

Tuples: Tuple Operations and methods, Dictionary :Dictionary Operations and methods; Files: Text Files, Reading and writing Files; Format Operator, Command line argument

UNIT V EXCEPTION H AND LING AND GRAPHICS 9

Date & Time Methods, Exception handling clauses, Raising an Exception, User Defined Exception; Simple graphics and image processing, simple 2d drawing-colors and shapes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

- To understand the evolution of Python and run basic python programs.
- To structure simple python programs for solving programs.
- To Decompose larger programs into functions.
- To Understand compound structures like list, tuple, dictionary.
- To Learn basic 2d graphics concepts in Python.

TEXTBOOKS:

1. Allen B.Downey,`` Think Python: How to Think Like a Computer Scientist ‘‘, 2nd edition, Updated for Python 3, Shroff O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guidovan Rossum and Fred L.Drake Jr,―An Introduction to Python–Revised and updated for Python 3.2, Network Theory Ltd., 2011.

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1. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘ ,Revised and expanded Edition, MIT Press ,2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,,2015.
4. Kenneth A.Lambert, ―Fundament also Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach,―Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo,―Practical Programming :An Introduction to Computer Science using Python3‖, Second edition, Pragmatic Programmers, LLC, 2013.

JCE1201	ENGINEERING MECHANICS	L	T	P	C
		2	2	0	3

OBJECTIVES:

- To impart knowledge about the basic laws of statics and dynamics and their applications in problem solving.
- To acquaint both with scalar and vector approaches for representing forces and moments acting on particles and rigid bodies and their equilibrium.
- To give exposure on inertial properties of surfaces and solids.
- To provide an understanding on the concept of work energy principle, kinematics of motion and their relationship.
- To provide and understanding on friction forces.

UNIT I BASICS AND STATICS OF PARTICLES 12

Fundamental concepts and laws of mechanics; force system; vectorial representation of forces-vector operations; resolution of forces; Forces in space - Equilibrium of a particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODY 12

Types of beams, loads, supports, determination of support reactions - Free body diagram - reactions of rollers - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Scalar components of a moment -Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Examples.

UNIT III PROPERTIES OF SURFACES 12

Properties of surfaces - centroid, centroid of simple regular section (circle, triangle and rectangle) using integration - method of calculating centroid of composite sections - composite planes such as L-I-T. Moment of inertia of simple sections (circle, triangle and rectangle) using integrations. Parallel axis theorem and perpendicular axis theorem. Concept of polar moment of inertia. Principal moment of inertia and principal axis of composite sections such as T, I, L.

UNIT IV DYNAMICS ANDLAWS OFMOTION 12

Displacement, velocity and acceleration, their relationship-Relative motion - vibration and vibration isolation - Translation and rotation of rigid bodies - general plane motion of simple rigid bodies - Newton's laws of motion - work energy Equation - Impulse and momentum-impact of elastic bodies.

UNIT V FRICTION 12

Friction force-types of friction-characteristics of dry friction-laws of dry friction and sliding friction-equilibrium analysis of simple systems with sliding friction-rolling resistance-problems involving belt, ladder, screw and wedge**.**

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

- To analyze and resolve forces, moments and solve problems using various principles and laws of Mechanics.
- To analyze the concept to equilibrium to particles and solve problems.
- To analyze the concept to equilibrium to rigid bodies and solve problems.
- To analyze and determine the properties of surfaces.
- To analyze and evaluate the fractional forces between the bodies.

TEXT BOOKS:

1. Beer, F.Pand Johnston Jr.E.R., "Vector Mechanics for Engineers (InSIUnits): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, NewDelhi (2004).
2. VelaMurali, "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 Mohana Rao.G.,"Engineering Mechanics-Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. MeriamJ.L.and Kraige L.G.,"Engineering Mechanics-Statics-Volume1,Dynamics–Volume 2", Third Edition, John Wiley & Sons, 1993.
5. Rajasekaran S and Sankara subramanianG., "Engineering Mechanics Statics and Dynamics", 3rdEdition,Vikas Publishing House Pvt. Ltd., 2005.

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2. https://easyengineering.net/engineeringmechanics
3. https://freevideoeslectures.com/engineeringmechanics
4. https://nptel.ac.in/courses

MAPPING OF CO'S-PO'S

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

JGE1202	ENGINEERING GRAPHICS & DESIGN	L	T	P	C
		1	0	4	3

COURSE OBJECTIVES:

- To understand the importance of graphics in engineering.
- To develop skills in preparation of basic drawing.
- To improve their technical communication skill in the form of communicative drawing.
- To impart knowledge about standard principle of or the graphic projection of objects.
- To improve the visualization skills for developing new products.

UNIT I PLANE CURVES AND FREE HAND SKETCHING CURVES USED IN ENGINEERING PRACTICES: 15

Conics–Construction of ellipse, Parabola and hyperbola by eccentricity method– Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves. Representation of Three Dimensional objects – General principles of orthographic projection– Need for importance of multiple views and their placement – First angle projection – layoutviews – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS 15

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other–Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Familiarize with the fundamental and standards of engineering graphics.
- Perform free hand sketching of basic geometrical constructions and multiple views of object.
- Project orthographic projections of lines and plane surfaces.
- Draw projection of solids and development of surfaces.
- Interpret isometric and perspective view of objects.

TEXTBOOKS:

1. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers,Chennai, 2009.
2. Venugopal K and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol.I&IIcombined), Subhas Stores, Bangalore, 2007.
4. 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.
5. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, NewDelhi, 2015.
6. Shah M. B and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS10711-2001: Technical products Documentation –Size and layout 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. IS 15021(Parts 1 to 4) -2001: Technical drawings-Projection Methods.

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1. www.pdfdrive.com/engineeringdrawing-books.html
2. https://freevideolectures.com
3. https://nptel.ac.in/courses

JNC1261	ENVIRONMENTAL SCIENCE	L	T	P	C
		3	0	0	0

OBJECTIVES:

- To study the interrelationship between living organism and environment.
- To find and implement scientific, technological and environmental problems due to pollution.
- To study the various natural resources and responsibility of the individual to conserve it.
- To study the social issues over environment.
- To get knowledge on population explosion, human rights and value education.

UNIT I ENVIRONMENT, ECO SYSTEMS AND BIO DIVERSITY 9

Definition, scope and importance of environment - need for public awareness - concept of an ecosystem - structure and function of an ecosystem - energy flow in the ecosystem - ecological succession - food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species and ecosystem diversity - value of biodiversity - threats to biodiversity - conservation of biodiversity: In- situ and ex-situ conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition - causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - Solid waste management: causes, effects and control measures of municipal solid wastes - Role of an individual in prevention of pollution.

UNIT III NATURAL RESOURCES 9

Forest resources: Use and over-exploitation, deforestation, case studies - timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources- effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: renewable and non renewable energy sources, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

water conservation- watershed management - resettlement and rehabilitation of policy. - consumerism and waste products - environment production act - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act - Forest conservation act - enforcement machinery involved in environmental legislation - central and state pollution control boards - Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Human population growth, variation among nations population explosion - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare - role of information technology in environment and human health.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of course completion, students will be able to

- Explain about ecosystem, their structure and function to conserve biodiversity.
- Recognize the level of environmental pollution and their control measures.
- Explain about the various types of natural resources and role of a human being in maintaining a clean sustainable environment for the future generations.
- Identify the social problems in the environment to reduce social issues.
- Understand environment and human health–human rights–value education, and the role of information technology in environment and human health.

TEXTBOOKS:

1. Erach Bharucha, - Textbook of Environmental Studies, Universities Press (I) PVT, LTD,Hydrabad,2015.
2. Benny Joseph, Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:

1. Dharmendra S.Sengar, Environmental law , Prentice hall of India PVT Ltd, NewDelhi,2007.
2. Erach Bharucha, -Text book of Environmental Studies‖, Universities Press (I) PVT, LTD, Hydrabad, 2015.
3. Rajagopalan, R, Environmental Studies-From Crisisto Cure, Oxford University Press,2005.
4. G.Tyler Miller and Scott E. Spoolman, - Environmental Science, Cengage Learning India PVT, LTD, Delhi, 2014.

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2. https://www.csindia.org/understanding-eia-383
3. https://nptel.ac.in/courses/120108004

JGE1211	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- To implement basic 2D diagrams.

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Guess an integer number in a rang
6. Insert a card in a list of sorted cards.
7. Multiply matrices
8. Programs that take command line arguments (word count)
9. Find the most frequent words in a text read from a file
10. Create an User defined Exception
11. Draw a 2d circle and square

TOTAL: 60 PERIODS

PLAT FORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Pythonlists, tuples, dictionaries for representing compound data.
- Draw 2 D graphic diagrams in Python.

JCE1211	COMPUTER AIDED BUILDING DRAWING	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To make the students familiarize with the graphic skills for communication of concepts, ideas and design of building drawing.
- To make the students familiarize in drafting residential buildings with load bearing wall industrial building and framed structures.
- To prepare the student to be an effective user of a CAD system.
- To expose the knowledge in Building Information Modeling.
- To illustrate the students to existing national standards related to technical drawings.

LIST OF EXPERIMENTS

1. Principles of planning, orientation and complete joinery details (Paneled and Glazed
   Doors and Windows)
2. Buildings with load bearing walls
3. Buildings with sloping roof
4. R.C.C. framed structures.
5. Industrial buildings - North light roof structures
6. Building Information Modeling

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Draw the plan, elevation and sectional views of the various types of building.
- Perceive the various features of cad.
- Know the various components of the building.
- Recognize the national building standards while drawing the plan
- Design the building with building information modeling system.

TEXTBOOKS:

1. SikkaV.B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons, 2015.
2. George Omura, Mastering in Auto CAD 2005 and Auto CADLT2005-BPB Publications, 2008.

REFERENCES:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook: A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons.Inc.,2011.
2. Marimuthu.V.M.,Murugesan.R.and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.
3. Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited, 2007.
4. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 2010.
5. National Building Code of India 2016 Volume 1, 2 published by Bureau of Indian Standards.

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3. http://home.iitk.ac.in/~anupams/ME251/EDP.pdf

MAPPING OF CO's-PO's

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

SEMESTER – III

		L	T	P	C
JMA1302	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**	**2**	**2**	**0**	**3**

COURSE OBJECTIVES:

- To enable students to understand Fourier series expansions and Harmonic analysis.
- To equip students with the knowledge of Fourier transforms which is used in signals and systems?
- To enable students to understand Z transforms and its applications in solving Difference equations.
- To introduce methods of solving partial differential equations.
- To familiarize students in the concepts of using Fourier series in solving boundary value problems.

UNIT 1 FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Complex form of Fourier series - Harmonic analysis.

UNIT II FOURIER TRANSFORMS 12

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

UNIT III Z- TRANSFORMS AND DIFFERENCE EQUATIONS 12

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

UNIT IV 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 V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDEs – Fourier series solutions - one-dimensional wave and heat conduction equations – Steady state two-dimensional equation of heat conduction.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: To demonstrate efficient use of Fourier series which plays a vital role in engineering applications.

CO2: To understand problem solving in Fourier transforms and Fourier integral representations.

CO3: To use Z transforms as a tool for solving difference equations.

CO4: To solve a given partial differential equation for singular and general solutions.

CO5: To model physical problems as boundary value problems and use Fourier series for solving them.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. S.Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for EngineeringStudents", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

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1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
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CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

JCE1301	SURVEYING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the principles of various surveying methods.
- To impart knowledge on various methods of surveying and its applications.
- To acquire knowledge on total station and GPS.
- To familiarize with advanced surveying methods.
- To gain knowledge on application of remote sensing.

UNIT I FUNDAMENTALS OF SURVEYING 9

Definition – Principles – Classification – Scales – Conventional signs – Survey instruments, their care and adjustment – Field book – Ranging and chaining – Plane Table Survey – Prismatic compass -Surveyor's compass - Bearing systems and conversions - Magnetic declination – Dip Correction and errors.

UNIT II LEVELLING AND CONTOURING 9

Levelling – Fly and check levelling – Reciprocal levelling – Theodolite – Fundamental and Desired lines – Angle Measurements – Benchmarks – Temporary and permanent adjustments- Calculation of areas and volumes – Contouring – Methods – Characteristics – uses of contours – Plotting – Earth work volume – Capacity of reservoirs.

UNIT III ELECTRONIC MEASUREMENT METHOD 9

Electronic Distance meter – Electro optical system – Measuring Principle – Working Principle – Sources of error – Total station – Microwave system – Measuring - working principle -Sources of error – GPS – Fundamentals – Space segments - Control segments- User segment - Types of GPS Survey – Static and kinematic survey.

UNIT IV ADVANCED SURVEYING METHODS 9

Aerial photographs – vertical and oblique photographs – height determination contouring – stereoscopy – Parallax Flight Planning – Photo interpretation- Applications of aerial Photos – Hydrographic survey – Geodetic surveying – Surveying using Drones – LIDAR surveying - Case studies.

UNIT V REMOTE SENSING 9

Introduction – Historical Background – Electromagnetic Radiation(EMR) –Electromagnetic Spectrum – Airborne Platforms – Sensors – Definition – Types – Parameter – Optical Remote Sensing – Microwave remote sensing scanners – Radiometer – Radar - GIS – GPS application in surveying – Introduction to QGIS and its applications.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Experiment different surveying instruments.
CO2: Apply levelling and contouring techniques to determine area and volume.
CO3: Demonstrate the use of total station and GIS techniques.
CO4: Review advanced surveying methods in field applications.
CO5: Interpret data applying remote sensing concepts.

TEXTBOOKS:

1. Duggal, S.K, “Surveying Vol. I and II”, Tata Mc Graw Hill, 2019.
2. Basak,N.N, “Surveying and Levelling”, Mc Graw - Hill Book Company, 2017.
3. Satheesh, G, Sathishkumar, R, Madhu,N, “Advanced Surveying, Total Station GPS and Remote Sensing", Pearson education, 2017.

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1. James, M.Anderson, Edward .M.Mikhail, “Surveying, Theory and Practice”, 7th Edition, Mc Graw Hill, 2001.
2. Roy, S.K, “Fundamentals of Surveying”, second Edition, Prentice Hall of India, 2004.
3. Chandra, A.M, “Plane Surveying”, New Age International Publishers,2002.
4. Laurila,S.H, “Electronic Surveying in Practice”, John Wiley and Sons Inc., 1993.
5. Punmia, B.C, Ashok,K.Jain, Arun,K.Jain, “Surveying Vol.I& II”, Lakshmi Publications Pvt Ltd, New Delhi, 2005

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1. http://www.surveyofindia.gov.in/
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3. https://www.ngs.noaa.gov/PUBS_LIB/GeoLay.pdf
4. https://nptel.ac.in/courses/105/107/105107158/
5. http://www.heliceo.com/en/industries/drone surveying-applications/

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1302	SUSTAINABLE BUILDING MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To grasp wide spread knowledge on various building materials used in Civil Engineering.
- To gain knowledge on the properties and uses of various construction materials.
- To identify the functional role of ingredients of concrete.
- To become familiarize with modern building materials.
- To explore the concept of sustainability and its implementations in the built environment.

UNIT I BUILDING STONES-BRICKS-CONCRETE BLOCKS 9

Definition – Classification – quarrying and dressing – Use – Testing – Characteristics of a good building stone – Deterioration and preservation of stones – Bricks – constitutes of Good Bricks - Manufacturing and testing – Hollow block – bricks – Breathe bricks – Concrete blocks -Light weight concrete blocks – Case studies on various building materials.

UNIT II LIME – CEMENT – AGGREGATES - MORTAR 9

Lime: Introduction, types and uses – Cement: ingredients, manufacturing, types, super hydrophobic cement- hydrogel – Properties of cement – Hydration – Compressive strength – Tensile strength - Fineness – Soundness and consistency – Setting time – Aggregates – Fine and coarse - Classification, sources, Properties – Grading – M-Sand - Mortar and plaster - Functions and qualities.

UNIT III CONCRETE 9

Concrete – Ingredients – Manufacturing Process – Batching plants – mixing – transporting – placing – compaction of concrete – curing and finishing – Ready mix Concrete -High Performance concrete – Self compacting concrete - Bamboo reinforced concrete - Admixtures in concrete.

UNIT IV MODERN MATERIALS 9

Glass – Ceramics – Fibre glass reinforced plastic – Rubber – Composite materials – Types – Applications of laminar composites – Geo membranes and Geo-textiles for earth reinforcement – Advancement using Nanotechnology.

UNIT V SUSTAINABILITY 9

Definition of sustainability – Dimension – Three Pillars – Principles (5R) - Construction material resource efficiency – Reuse of construction materials - Construction demolition waste - Waste minimization - Sustainability of concrete.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Explain the overview of materials used in construction.
CO2: Demonstrate the stages in the cement hydration reaction.
CO3: Assess the different types of concrete based on their specific properties.
CO4: Distinguish between conventional and modern building materials.
CO5: Apply sustainable building materials for various field applications.

TEXTBOOKS:

1. Varghese, P.C, "Building Materials", PHI Learning Pvt.Ltd, New Delhi,2015.
2. Rajput, R.K, "Engineering Materials",S. Chand and Company Ltd., 2008.
3. Gambhir M.L,"Concrete Technology",3rd Edition, Tata McGraw Hill Education, 2004.

REFERENCES:

1. Duggal,S.K, "Building Materials", 4thEdition, New Age International, 2008.
2. Bibhuti,B.Das, Narayanan.N,“Sustainable Construction and Building Materials”, Springer, 2018.
3. Jagadish,K.S,"Alternative Building Materials Technology",New Age International,2007.
4. Ravindra, K.Dhir, O.B.E, Jorgede Brito, Rui,V.S., Chao Q.L, “Sustainable ConstructionMaterials: Recycled Aggregates”, Wood head Publishing,2019.
5. Gambhir, M.L, Neha Jamwal, "Building Materials, products, properties and systems",Tata McGraw Hill Educations Pvt.Ltd, New Delhi,2012.

IS CODE BOOKS:

1. IS456-2000: Indian Standard specification for plain and reinforced concrete, 2011.
2. IS4926-2003: Indian Standard specification for ready – mixed concrete, 2012.
3. IS383-1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011.
4. IS 1542-1992: Indian standard specification for sand for plaster,2009.

5. IS10262-2009: Indian Standard Concrete Mix Proportioning - Guidelines, 2009.

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2. https://onlinecourses.swayam2.ac.in/arp19_ap75/
3. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-964-design-for- sustainability-fall-2006/lecture-notes/
4. https://c2e2.unepdtu.org/wp-content/uploads/sites/3/2016/08/unep-handbook-of-sustainable- building-policies.pdf
5. https://www.mdpi.com/2075-5309/2/2/126/pdf

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1303	FLUID MECHANICS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To acquire basic knowledge on fluid properties.
- To solve problems related to fluid statics and kinematics.
- To introduce the basic concepts of fluid dynamics and its applications.
- To understand the concepts of boundary layer and the theory involved.
- To gain knowledge on dimensional and model analysis.

UNIT I FLUID PROPERTIES 12

Fluid – definition, distinction between solid and fluid – Units and dimensions – Properties of fluids – density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension – Continuum concept of system and control volume.

UNIT II FLUID STATICS AND KINEMATICS 12

Fluid statics: Pascal's law and hydrostatic equation – concept of fluid static pressure, absolute and gauge pressures – pressure measurements by manometers – Forces on plane -Buoyancy- Meta centre. Fluid Kinematics: Classification of flow – continuity equation (one and three dimensional differential forms) – stream, streak and path line – stream and potential function - flow net – Velocity measurement.

UNIT III FLUID DYNAMICS 12

Control Volume Approach – Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates -Hagen Poiseuille equation- Turbulent flow – Difference between Laminar and turbulent flow -Real time applications of laminar and turbulent flow.

UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES 12

Definition of boundary layer – classification – Displacement and momentum thickness – pipe roughness – friction factor – Darcy – Weisbach formula – Moody's diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V DIMENSIONAL ANALYSIS AND MODEL STUDIES 12

Fundamental dimensions – dimensional homogeneity – Rayleigh's method and Buckingham Pi-theorem – application – significance of dimensionless number – model laws – classification of models – similitude's and model studies – scale effect and distorted models.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Assess the basic properties of fluid.
CO2: Demonstrate the concepts of statics and dynamics of fluid flow.
CO3: Compute the major and minor losses occurring in pipe flow.
CO4: Apply boundary layer theory in real fluid flows.
CO5: Develop models and prototypes.

TEXTBOOKS:

1. Modi,P.N, Seth,"Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi,2009.
2. Jain,A.K,"Fluid Mechanics (Including Hydraulic Machines)", Khanna Publishers, Twelfth Edition, 2016.
3. Bansal,R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt.Ltd, New Delhi,2013.

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1. Streeter,V.L, Wylie, E.B, "Fluid Mechanics",McGrawHill, 2000.
2. Fox,W.R,McDonaldA.T, "Introduction to Fluid Mechanics" John-Wiley and Sons, Singapore,2013.
3. White, F.M,"FluidMechanics",Tata Mc Graw Hill,5th Edition, New Delhi, 2017.
4. Mohd.Kaleem Khan,"Fluid Mechanics and Machinery", Oxford University Press, NewDelhi,2015.

5. Subramanya, K,"Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi,2010.

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2. https://nptel.ac.in/courses/112/105/112105269/#
3. https://swayam.gov.in/nd1_noc19_ce28/preview
4. https://ocw.mit.edu/courses/mechanical-engineering/2-25-advanced-fluid-mechanics-fall- 2013/
5. https://ocw.mit.edu/courses/mechanical-engineering/2-06-fluid-dynamics-spring-2013/

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1304	STRUCTURAL MECHANICS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of stress, strain and deformation of solids.
- To analyze the mechanism of load transfer, stress resultants and deformations in beams.
- To gain knowledge on deflection and shear stress distribution in beams.
- To understand the concepts of columns and the analysis of trusses.
- To get knowledge on the concepts of torsion in shafts.

UNIT-I FUNDAMENTALS OF STRESS AND STRAIN 12

Simple Stresses and strains – Elastic constants – Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Composite Bars – Thermal Stresses – State of Stress in two dimensions – Principal Stresses and Principal Planes – Maximum shear stress- Mohr's circle.

UNIT-II TRANSFER OF LOADS AND STRESSES IN BEAMS 12

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 - Simple theory of bending.

UNIT-III DEFLECTION OF BEAMS AND SHEAR STRESSES 12

Deflection of beams – double integration method – Macaulay's method – variation of shear stress – shear stress distribution in rectangular, I sections, solid circular sections, hollow circular sections, angle and channel sections-shear centre.

UNIT-IV COLUMNS AND TRUSSES 12

Stable and unstable equilibrium – Different types of column and different methods of design of columns – Euler's formula for long columns, Rankine's formula – Determinate and in determinate trusses – Analysis of pin jointed plane determinate trusses by method of joints, method of sections.

UNIT-V TORSION AND SPRINGS 12

Stresses and deformation in circular (solid and hollow shafts) – stepped shafts - shafts fixed at both ends - stresses in helical springs - deflection of springs.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Demonstrate the principal stresses and principal planes.
CO2: Determine the shear force and bending moment in beams.
CO3: Compute the deflection of determinate beams.
CO4: Analyze the simple trusses and calculate the reactions.
CO5: Assess the deflection of springs and torsion in solid and hollow shafts.

TEXTBOOKS:

1. Rajput, R.K, "Strength of Materials", S.Chand and Co, New Delhi,2015.
2. Punmia,B.C, AshokK.Jain, ArunK.Jain, "Strength of materials", Laxmi publications, NewDelhi, 2015
3. Rattan,S.S, "Strength of Materials", Tata Mc Graw Hill Education Private Limited, New Delhi, 2012.

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1. Timoshenko, S.B., and Gere, J.M, "Mechanics of Materials", Van Nos Reinbhold, NewDelhi1999.
2. Vazirani, V.N, Ratwani, M.M, "Analysis of Structures, Vol I", Khanna Publishers, NewDelhi,1995.
3. Bansal, R.K, "Strength of Materials", Laxmi Publications Pvt. Ltd, NewDelhi, 2010.
4. Singh, D.K, "Strength of Materials", Ane Books Pvt. Ltd, New Delhi,2016.
5. Egor,P.Popov, "Engineering Mechanics of Solids",2 nd edition, PHI Learning Pvt. Ltd., NewDelhi,2012.

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2. http://web.mit.edu/course/3/3.225/book.pdf
3. https://mechanicalc.com/reference/strength-of-materials
4. http://www.learnaboutstructures.com/Stability-Determinacy
5. https://www.ecourses.ou.edu/cgi-bin/ebook.cgi?doc=&topic=me&chap_sec=07.4&page=theory

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
AVG	3	3

JCE1311	SURVEYING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To determine the relative position of any object or point of the earth.
- To determine the distance and angle between different objects.
- To prepare a map or plan to represent an area on a horizontal plan.
- To develop methods through the knowledge of modern science and technology and use them in the field.
- To solve measurement problems in an optimal way.

LIST OF EXPERIMENTS:

Chain Survey

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset
2. Setting out works – Foundation marking using tapes single Room and Double Room

Compass Survey

3. Compass Traversing - Measuring Bearings & arriving included angles

Leveling – Study of levels and leveling staff

4. Fly leveling using Dumpy level And Tilting level
5. Check leveling

Theodolite - Study of Theodolite

6. Measurements of horizontal angles by reiteration and repetition and vertical angles.
7. Determination of elevation of an object using single plane method when base is accessible and inaccessible.

Total Station- Study of Total Station, Measuring Horizontal and vertical angles

8. Traverse using Total station and Area of Traverse
9. Determination of distance and difference in elevation between two inaccessible points using Total station

GPS

10. Study of Global Positioning System (GPS) and its Accessories
11. Observations using GPS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S.No	Description of Equipment	Quantity
1	Total Station	3 Nos
2	Theodolite	Atleast 1 for every 5 students
3	Dumpy level /Filling level	Atleast 1 for every 5 students
4	Pocket stereoscope	1
5	Ranging rods	1 for a set of 5 students
6	Levelling staff	
7	Cross staff	
8	Chains	
9	Tapes	
10	Arrows	
11	Prismatic Compass	3 Nos
12	Surveyor Compass	2 Nos
13	Survey grade or Hand held GPS	3 Nos

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Apply various survey instruments including Theodolite, Total Station and GPS in field surveying.
CO2: Compute area and difference in levels by conducting Triangulation and Leveling.
CO3: Interpret survey data and compute areas and volumes.
CO4: Perform field marking for various engineering projects.
CO5: Measure the land and fix its boundaries.

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1. Russell, C, Brinker, RoyM, "The Surveying Handbook", Springer Science & Business Media, 2013.
2. Colonel, H.L,Thuiller,Lt.Colonel, R.Symth., "A Manual of Surveying for India",Thacker Spink and Company, 1875.

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1. https://ctt.mtu.edu/sites/default/files/flyers/Surveying%20manual.pdf
2. https://nptel.ac.in/courses/105/107/105107158/
3. http://www.vlab.co.in/ba-nptel-labs-civil-engineering

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1312	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To find the Young Modulus, torsional strength, hardness and tensile strength of given specimens.
- To find stiffness of open coiled and closed coiled springs.
- To test the different materials under the action of various forces.
- To determine the characteristics of materials experimentally.
- To determine the compressive strength of wood and brick.

LIST OF EXPERIMENTS:

1. Tests on springs - modulus of rigidity of the spring.
2. Deflection test
3. Stress-strain characteristics of HYSD bars.
4. Young's modulus of the given material (steel or wood) by conducting a bending test on a simply supported beam.
5. Hardness Test (Brinell/Rockwell/Vickers)
6. Torsion test on mild steel rod
7. Double shear test on metal
8. Compression test on wood
9. Compression test on Tiles
10. Impact test on metal specimen (Izod).

TOTAL : 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Description of Equipment	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) Brinell	1 each
5	Beam deflection test apparatus	1
6	Extensometer	1
7	Compressometer	1
8	Dial gauges	1
9	Spring Testing Machine	1

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1:Compute Young Modulus, torsional strength, hardness and tensile strength of given specimens.
CO2: Calculate stiffness of open and closed coiled springs.
CO3: Determine the properties of structural elements.
CO4: Experiment different methods of material testing.
CO5: Assess physical properties of given materials.

REFERENCES:

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS1786-2008 (Fourth Revision, Reaffirmed 2013),"High strength deformed barsand wires for concrete reinforcement -Specification", 2008.

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2. https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JPT1001	SOFT SKILLS AND APTITUDE I	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES:

- To help students groom their personality and develop their skill of building social relationships
- To improve the personality traits of students and their creativity
- To help students gain knowledge in rational thinking and aptitude
- To make students think logically and judiciously
- To help student acquire technical skills in C programming language

UNIT I SOFT SKILLS AND APTITUDE - I 5

Self – Realization – Self Motivation – Relationship Building – Personality Enrichment– Personality Traits – Intra Personal Communication – Inter Personal Communication – Behavioral Based Perception – Attitude & Behavior– SWOT Analysis

UNIT II SOFT SKILLS AND APTITUDE – II 5

Dimensions of Personality – Self Confidence – Open Mindedness – Acceptance – Creativity - Strategies for developing creativity – Overcoming myths of creativity – Presence of Mind – Staying Focused – Self Acceptance – Self Growth

UNIT III QUANTITATIVE APTITUDE 6

Number system – Divisibility Rule – Simplification – Surds and Indices – Square root and Cube root – Averages – Percentage

UNIT IV LOGICAL REASONING 6

Number series – Alphabet series – Alphabet test – Word test – Letter Arrangement – Word Arrangement – Coding and Decoding – Analogy

UNIT V TECHNICAL APTITUDE IN C - I 8

Technical aptitude in C: Program Structure – Data types – Variables – Constants – Operators – Decision Making - Switch statement – Looping statements – Functions – Call by reference - Recursive Arrays, single dimensional, Multi-dimensional

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Build better relationship with all in their social settings.
CO2: Engage in creative activities focusing on their career.
CO3: Solve the real time and complex problems in aptitude.
CO4: Solve critical reasoning and real time application problems.
CO5: Apply their knowledge in the basics of C programming.

TEXTBOOKS:

1. Agarwal,R.S, "Quantitative Aptitude for Competitive Examinations", Tata Mc Graw-Hill Education,2011.
2. Agarwal,R.S, "A Modern Approach to Verbal & Non Verbal Reasoning", S Chand & Company Limited,2010.
3. Pradip, D, Manas G,"Fundamentals of Computing and Programming in C", First Edition,Oxford University Press, 2009.
4. Yashavant.P. Kanetkar, "Let Us C", BPB Publications,2011.

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2. https://m4maths.com/placement-puzzles.php
3. https://www.youtube.com › watch/average
4. https://www.youtube.com › watch/coding and decoding
5. https://www.youtube.com › watch/c programs
6. https://www.youtube.com › watch/self confidence
7. https://www.youtube.com › watch/motivation

SEMESTER – IV

JMA1402	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To provide basic concepts of discrete, continuous random variables and standard distributions.
- To acquaint students with statistical testing of hypothesis and its applications.
- To introduce numerical techniques for solving system of equations and interpolation problems that arise in engineering applications.
- To acquaint the students with the understanding of numerical differentiation and integration.
- To familiarize students in solving differential equations through numerical methods.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Exponential and Normal distributions.

UNIT II TESTING OF HYPOTHESIS 12

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 - Goodness of fit.

UNIT III SOLUTION OF EQUATIONS AND INTERPOLATION 12

Solution of algebraic and transcendental equations – Fixed point iteration method and Newton Raphson method – Solution of linear system of equations – Direct methods of Gauss elimination and Gauss Jordan – Iterative methods of Gauss-Jacobi and Gauss-Seidel – Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal intervals – Lagrange interpolation and Newton's divided difference interpolation.

UNIT IV NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and 3/8 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT V INITIAL VALUE PROBLEMS 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 – Bash forth predictor corrector methods for solving first order equations.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: To understand random variables and use standard distributions in solving real time problems.

CO2: To apply hypothesis testing for making statistical inferences in large and small sample real life problems.

CO3: To demonstrate efficient use of numerical techniques in solving system of equations and interpolation problems.

CO4: To solve problems of differentiation and integration through numerical methods.

CO5: To apply single and multistep methods for solving initial value problems.

TEXT BOOKS:

1. Ibe, O.C.,"Fundamentals of Applied Probability and Random Processes", 1st Indian Reprint, Elsevier, 2007.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
4. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

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1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi, 8th Edition, 2014.
2. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum‘s Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
3. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
4. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
5. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

JCE1401	SOIL MECHANICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on soil index properties.
- To assess the effective stress and permeability characteristics of soil.
- To evaluate the amount of consolidation and settlement.
- To gain knowledge on shear strength including Mohr-Coulomb failure criterion.
- To acquire basic knowledge on stability of slopes on engineering design.

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Types of soil - Grain size distribution - composition - Index properties - clay mineralogy structural arrangement of grains - Anion and Cation exchange capacity of clays- specific surface area- bonding in clays - Classification - BIS - US - phase relationship - Atterberg's limits - Relative density-field Compaction method - factors influencing compaction.

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9

Soil water - Effective stress concepts in soils - Capillary phenomena - Permeability - Darcy's law - Determination of Permeability- Factors influencing permeability of soils- quick sand condition - Seepage - Laplace's equation -flow nets - properties -uses - Seepage pressure - Swelling and shrinkage behavior of soil.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium - Boussinesq theory - (Point load, Line load, Rectangular load and udl) - Westergaard theory - Components of settlement - Immediate and consolidation settlement - Factors influencing settlement -Terzaghi's one dimensional consolidation theory – Pre consolidation pressure by Casagrande methods- Secondary consolidation - Leaning tower of Pisa - Case studies.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils - Mohr- Coulomb failure theory - shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests - Pore pressure parameters - Factors influences shear strength of soil- Liquefaction and cyclic mobility of saturated sands- stress path for CD and CU of clays.

UNIT V STABILITY OF SLOPES 9

Infinite slopes and finite slopes - Swedish circle methods-Mohr circle method - Friction circle method - Bishop's method - Use of stability number - Guidelines for location of critical slope surface in cohesive and c - soil - Slope protection measures - Landslide application - Role of Geo-synthetics in stabilization of slope.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Classify soil and assess the engineering properties.
CO2: Analyze the permeability behavior of soil.
CO3: Review the stress distribution in soils.
CO4: Compute shear strength of soil.
CO5: Demonstrate the methods to improve the stability of soil.

TEXT BOOKS:

1. Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", CBS Publishers, 2017.
2. Purushothama, R.P, "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson. Education, 2013.
3. Varghese, P.C, "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005.

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1. Das, B.M, "Principles of Foundation Engineering", 5th edition, Thompson Asia Pvt. Ltd., Singapore, 2003.
2. Kaniraj, S.R, "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2002.
3. Punmia, B.C, "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd, New Delhi,2005.
4. Venkatramaiah, C, "Geotechnical Engineering", New Age International Publishers, New Delhi, 2007.
5. Arora, K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005.

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3. https://nptel.ac.in/courses/105/103/105103177/
4. http://csmrs.gov.in/
5. http://ecoursesonline.iasri.res.in/course/view.php?id=544

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE1402	OPEN CHANNEL HYDRAULICS AND FLUID MACHINERY	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To introduce the wide spread knowledge on open channel flow and different types of flows.
- To learn the basics of uniform flow in open channels.
- To acquire knowledge on gradually varied and rapidly varied flows and their computations.
- To introduce the concepts of momentum principles and application of turbines.
- To impart practical knowledge on pumps.

UNIT I OPEN CHANNEL FLOW 12

Open channel flow - Types of channels - Chezy, Manning's, Bazin, Kutter's Equations - Types and regimes of flow - Velocity distribution in open channel - Wide open channel - Specific energy - Critical flow and its computation - channel transition.

UNIT II UNIFORM FLOW 12

Uniform flow - Determination of roughness coefficients - Determination of normal depth and velocity - Hydraulically efficient channel sections - Rectangular, Trapezoidal -Non-erodible channels.

UNIT III VARIED FLOW 12

Dynamic equations of gradually varied flow - Assumptions - Classification of flow profiles - Draw down and back water curves - Profile determination - Direct step and standard step method - Flow through transitions - Hydraulic jump - Types - Energy dissipation - Applications - Surges.

UNIT IV TURBINES 12

Turbines - Draft tube and cavitations - Application of moment of momentum principle - Impact of jets on plane and curved plates - Classification - Radial flow turbines - Axial flow turbines - Impulse and Reaction-Specific speed of turbine.

UNIT V PUMPS 12

Centrifugal pump - multistage Pumps - Jet and submersible pumps - reciprocating pump -negative slip - flow separation conditions - air vessels - indicator diagram.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Identify different types of fluid flows.
CO2: Identify an effective section for flow in different cross sections.
CO3: Demonstrate uniform, gradually and rapidly varied flows during steady state conditions.
CO4: Identify the various applications of momentum principles.
CO5: Select pumps for practical purposes.

TEXT BOOKS:

1. Modi, P.N, and Seth, S.M, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
2. Chandramouli, P.N. "Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.
3. Subramanya, K, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

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1. VenTe Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry, M, "Open Channel Flow", Second Edition, Springer, 2007.
3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
4. Jain, A.K, "Fluid Mechanics (Including Hydraulic Machines)", Khanna Publishers, Twelfth Edition, 2016.
5. Subramanya, K, "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.

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3. https://pubs.usgs.gov/of/1988/0707/report.pdf
4. http://ocw.snu.ac.kr/sites/default/files/NOTE/6145.pdf
5. https://scholarsmine.mst.edu/cgi/viewcontent.cgi?article=5974&context=masters_theses

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE1403	THEORY OF STRUCTURES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To introduce the basic theory and concepts of classical methods of structural analysis
- To identify, formulate and solve engineering problems using slope deflection method.
- To analyze structural analysis problems using moment distribution method.
- To draw the influence line diagram for determinate beams.
- To draw the influence line diagram for indeterminate beams.

UNIT I STRAIN ENERGY METHOD 12

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) - Theory of minimum potential energy.

UNIT II SLOPE DEFLECTION METHOD 12

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 12

Stiffness and carry over factors - Distribution and carryover of moments-Analysis of continuous Beams-Plane rigid frames with and without sway - Support settlement -Gable Frames - Kane's Method.

UNIT IV INFLUENCE LINES FOR DETERMINATE BEAMS 12

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 V INFLUENCE LINES FOR INDETERMINATE BEAMS 12

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.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Analyze continuous beams and frames by strain energy method.
CO2: Compute deflection of continuous beams and rigid frames by slope deflection method.
CO3: Demonstrate the moment distribution method for continuous beams and frames.
CO4: Report influence lines for statically determinate structures.
CO5: Identify the influence lines for statically indeterminate beams.

TEXT BOOKS:

1. Bhavikatti,S.S, "Structural Analysis,Vol.1 & 2",Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2014.
2. Punmia, B.C, Ashok K. Jain, and Arun K. Jain, "Theory of structures", Laxmi, Publications, 2004.
3. Vazrani, V.N, Ratwani,M.M., "Analysis of Structures, Vol.II", Khanna Publishers,2015.

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1. William, W, Gere, J.M, "Matrix analysis of framed structures", CBS Publishers &Distributors, Delhi, 1995.
2. Hibbeler, R.C, "Structural Analysis", VII Edition, Prentice Hall, 2012.
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4. Rajasekaran, S, Sankarasubramanian, G, "Computational Structural Mechanics", PHILearning Pvt. Ltd, 2015.
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3. https://structville.com/2018/03/analysis-of-industrial-gable- frames.html 5. https://link.springer.com/chapter/10.1007%2F1-4020-3111-4_8

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

O\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
AVG	3	3

JCE1411	SOIL MECHANICS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To learn index properties of soils.
- To classify the soil type.
- To acquire knowledge on Compaction and hydraulic conductivity tests.
- To understand the principles of Consolidation and shear strength.
- To obtain engineering properties of locally available soils.

LIST OF EXPERIMENTS:

1. DETERMINATION OF INDEX PROPERTIES **9**

a. Specific gravity of soil solids
b. Grain size distribution
c. Liquid limit and Plastic limit tests
d. Shrinkage limit and Differential free swell tests

2. DETERMINATION OF IN SITU DENSITY AND COMPACTION CHARACTERISTICS **6**

a. Field density Test (Sand replacement method and core cutter method)
b. Determination of moisture - density relationship using standard Proctor compaction test.
c. Determination of relative density (Demonstration only)

3. DETERMINATION OF ENGINEERING PROPERTIES **15**

a. Permeability determination (constant head and falling head methods)
b. One dimensional consolidation test (Determination of Coefficient of consolidation only)
c. Direct shear test in cohesionless soil
d. Unconfined compression test in cohesive soil
e. Laboratory vane shear test in cohesive soil
f. Tri-axial compression test in cohesionless soil (Demonstration only)
g. California Bearing Ratio Test

TOTAL:60 PERIODS

LIST OF EQUIPMENTS:

S.No.	List of Equipment	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	Direct Shear apparatus	1
7	Thermometer	2
8	Sand replacement method accessories and core cutter method accessories	2
9	Tri-axial Shear apparatus	1
10	Three Gang Consolidation test device	1
11	Relative Density apparatus	1
12	Vane Shear apparatus	1
13	Permeability Test Apparatus	1
14	California Bearing Ratio Test Apparatus	1
15	Weighing machine – 10kg capacity	1
16	Weighing machine – 1kg capacity	3

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Analyze the properties of soil.
CO2: Classify and record type of soil
CO3: Compute relative density by conducting Compaction and hydraulic conductivity tests.
CO4: Interpret the test data and assess obtain engineering properties of soil.
CO5: Apply soil data in geotechnical designs.

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1. "Soil Engineering Laboratory Instruction Manual" published by EngineeringCollege Cooperative Society, Anna University, Chennai, 2010.
2. Lambe, T.W, "Soil Testing for Engineers", John Wiley and Sons, New York,1951.Digitized 2008.
3. Saibaba Reddy, Ramasastri, K, "Measurement of Engineering Properties of Soils", Newage International (P) Limited Publishers, New Delhi, 2002.
4. IS 2720-1983(Part – 1 to 41): Indian Standard Methods of test for soil.

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3. http://home.iitk.ac.in/~madhav/geolab.html
4. http://www.vlab.co.in/ba-nptel-labs-civil-engineering

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PO	PO1	PO2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE1412	HYDRAULICS MACHINERY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To explore the fundamental principles of fluid mechanics through experimentation.
- To demonstrate and analyze key hydraulic phenomena using hands-on physical devices.
- To investigate engineering design principles for pipe networks and open channel systems.
- To carry out performance studies on hydraulic machineries.
- To develop skills for analyzing experimental data and working in teams.

LIST OF EXPERIMENTS

1. Flow through venturimeter and orifice meter
2. Flow through variable duct area - Bernoulli's experiment
3. Flow through orifice, mouthpiece and notches
4. Determination of friction coefficient in pipes
5. Determination of minor losses
6. Characteristics of Pelton wheel turbine
7. Characteristics of Francis turbine
8. Characteristics of Kaplan turbine
9. Study on performance characteristics of centrifugal pumps (constant speed / variable speed)
10. Study on performance characteristics of reciprocating pump
11. Determination of metacentric height of floating bodies

TOTAL : 60 PERIODS

LIST OF EQUIPMENTS

1. One set up of Rotameter
2. One set up of Venturimeter/Orifice meter
3. One Bernoulli's Experiment set up
4. One set up of Centrifugal Pump
5. One set up of Submersible pump
6. One set up of Reciprocating Pump
7. One set up of Pelton Wheel turbine
8. One set up of Francis turbines/one set of Kaplan turbine
9. One set up of equipment for determination of Meta centric height of floating bodies
10. One set up for determination of friction factor in pipes
11. One set up for determination of minor losses.

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Apply the basic properties of a fluid in the fluid measurement systems.
CO2: Measure the flow in pipes and determine frictional losses.
CO3: Determine the characteristics of pumps and turbines.
CO4: Calculate the theoretical predictions and compare them with actual experimental measurements.
CO5: Solve the scientific and engineering problems.

REFERENCES:

1. Sarbjit Singh, "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. Modi, P.N, Seth, S.M, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
3. Subramanya, K. "Flow in open channels", Tata McGraw Hill Publishing. Company, 2001.
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3. http://www.vlab.co.in/ba-nptel-labs-civil-engineering

CO-PSO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	1	3
CO5	1	3
AVG	1	3

JPT1001	SOFT SKILLS AND APTITUDE II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To help students learn various forms of writing and develop content
- To help students acquire time and stress management skills
- To facilitate students to gain required knowledge to understand practical concepts in aptitude
- To develop the thinking and analytical skills of students
- To gain knowledge in concepts of C programming language

UNIT I SOFT SKILLS AND APTITUDE - III **5**

Communication - on Specific topics – both oral and written – Content development – various forms of writing and specific writing – Brainstorming – Individual – Concept focusing – Public Speaking – Analytical writing.

UNIT II SOFT SKILLS AND APTITUDE - IV **5**

Importance of Time – Time Management techniques – The art of prioritizing and scheduling –Stress– Positive and Negative Stress - Stress Management techniques – Concept of Goal setting– Importance of Goals – Dream vs Goal – Reasons for failure of Goals – SMART.

UNIT III QUANTITATIVE APTITUDE **6**

Ratio and Proportions – Allegations and Mixtures – Problem on Ages – Profit and Loss and Discount

UNIT IV LOGICAL REASONING **6**

Odd man out series – Blood Relation – Seating Arrangement – Number Ranking

UNIT V TECHNICAL APTITUDE IN C-II **8**

Strings - Storage Classes – Pointers – Preprocessor directives - Structures – Union. Type def – Input/Output – File I/O - Header Files – Type casting – Error handling – Command Line Arguments Variable Arguments – Memory Management - Bitwise operators.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Develop different types of content using the skillslearnt
CO2: Manage time and stress competently
CO3: Find answers to real time application problems
CO4: Use logical reasoning skills to solve problems differently
CO5: Apply C programming concepts for coding

TEXTBOOKS:

1. R.S Agrawal, "Quantitative Aptitude for Competitive Examinations", Tata McGraw-Hill Education, 2011.
2. R.S Agrawal, "A Modern Approach to Verbal &Non Verbal Reasoning", S Chand &Company Limited, 2010.
3. Pradip, D, Manas, G, "Fundamentals of Computing and Programming in C", FirstEdition, Oxford University Press, 2009.
4. Yashavant, P. Kanetkar, "Let Us C", BPB Publications, 2011.

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1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://m4maths.com/placement-puzzles.php
3. www.freshers world.com
4. https://www.youtube.com › watch>problems on ages
5. https://www.youtube.com › watch>blood relation
6. https://www.youtube.com › watch>content
7. https://www.youtube.com › watch>SMART
8. https://www.youtube.com › watch>strings in C

SEMESTER V

JCE1501	DESIGN OF REINFORCED CONCRETE STRUCTURES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To impart knowledge on design of reinforced concrete beams.
- To learn the design and detailing of slabs.
- To learn the design and detailing of columns and footings.
- To learn the design of retaining walls and staircases.
- To gain widespread knowledge on prestressed concrete structures.

UNIT I DESIGN OF REINFORCED CONCRETE BEAMS 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 DESIGN OF SLABS 9

Yield Line Theory - Behaviour 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 - Design of flat slabs.

UNIT III DESIGN OF COLUMNS AND FOOTINGS 9

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

UNIT IV DESIGN OF STAIRCASES AND RETAINING WALLS 9

Types of staircases - Design of dog-legged staircase - Design of cantilever retaining wall with back fill and surcharge.

UNIT V DESIGN OF PRESTRESSED CONCRETE STRUCTURES 9

Introduction to Prestressed concrete structures - Basic principles of prestressing - Methods of prestressing - 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Design singly and doubly reinforced beams using working and limit state methods.
- Design RC slab and draw the reinforcement details using limit state method.
- Design short columns and combined footings using codal provisions.
- Design staircases and retaining walls.

- Design prestressed concrete structures using IS 1343 codes.

TEXT BOOKS:

1. Punmia.B.C Ashok K. Jain and Arun K. Jain, "Limit State design of Reinforced Concrete",Laxmi Publications (P) Ltd., New Delhi, 2016.
2. Gambhir M L, "Fundamentals of Structural Steel Design", McGraw Hill Education IndiaPvt Limited, 2017.
3. Varghese P.C, "Limit State Design of Reinforced Concrete", Prentice Hall of India,Pvt.Ltd., New Delhi, Second Edition, 2008.

REFERENCES:

1. Unnikrishna Pillai and Devdas Menon, "Reinforced Concrete Design (Third Edition)",Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2017.
2. Subramanian.N, "Design of Reinforced Concrete Structures", Oxford University Press,New Delhi, 2014.
3. Sinha.S.N, "Reinforced Concrete Design", Tata McGraw-Hill, New Delhi, 2002.
4. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", StructuresPublilcations, Pune, 2013.
5. Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd.,New Delhi, 2008.

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 34:1987 Handbook of concrete reinforcement and detailing.
5. National Building Code of India 2016 (NBC 2016).
6. IS 1343 :1980 Code of Practice for Prestressed concrete.

WEBSITE REFERENCES:

1. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-054- mechanics-and-design-of-concrete-structures-spring-2004/lecture-notes/
2. https://nptel.ac.in/courses/105/105/105105105/
3. https://nptel.ac.in/courses/105/105/105105104/
4. https://nptel.ac.in/courses/105/106/105106117/
5. https://bis.gov.in/index.php/standards/technical-department/national-building-code

MAPPING OF CO'S-PO'S

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
AVG	3	3

JCE1502	ADVANCED THEORY OF STRUCTURES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To grasp knowledge on finite element analysis method used for structural elements.
- To analyze beams and frames by flexibility matrix method.
- To analyze framed structural elements by stiffness matrix method.
- To acquire knowledge on arches and suspension bridges.
- To learn the plastic analysis theory.

UNIT I FINITE ELEMENT ANALYSIS 9

Introduction – Discretization of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements

UNIT II FLEXIBILITY MATRIX METHOD OF ANALYSIS 9

Introduction - Development of flexibility matrix for plane truss element and axially rigid plane framed structural elements - Analysis of plane truss and axially rigid plane frames by flexibility method with static indeterminacy.

UNIT III STIFFNESS MATRIX METHOD OF ANALYSIS 9

Introduction - Development of stiffness matrix for plane truss element and axially rigid plane framed structural elements - Analysis of plane truss and axially rigid plane frames –stiffness method with kinematic indeterminacy.

UNIT IV ARCHES AND SUSPENSION BRIDGES 9

Analysis of Arches Two hinged and three hinged parabolic arches, circular arches, cables, influence line for horizontal thrust and bending moment in arches– suspension bridges with two and 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

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Analyze the structural elements by finite element method.
- Analyze the framed structural elements by flexibility matrix method.
- Analyze the framed structural elements by stiffness matrix method.
- Design arches and suspension bridges.
- Analyze the statically indeterminate structures by plastic analysis.

TEXT BOOKS:

1. Bhavikatti,S.S, "Structural Analysis,Vol.1 & 2", Vikas Publishing House Pvt.Ltd., 2014.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures",Laxmi, Publications,2004.
3. Vazrani.V.N And Ratwani,M.M, "Analysis of Structures, Vol.II", Khanna Publishers,2015.

REFERENCES:

1. Negi.L.S and Jangid R.S., "Structural Analysis", Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co.Ltd.2002.
3. Gambhir.M.L., "Fundamentals of Structural Mechanics and Analysis", PHI LearningPvt. Ltd.,2011.
4. Prakash Rao D.S., "Structural Analysis", Universities Press,1996.
5. R.C. Hibbler , "Structural Analysis", Pearson Education,2018.

WEBSITE REFERENCES:

1. https://nptel.ac.in/courses/105/106/105106050/
2. https://nptel.ac.in/courses/105/105/105105109/
3. https://nptel.ac.in/courses/105/101/105101085/
4. https://nptel.ac.in/courses/105/105/105105180/
5. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-054-mechanics-and-design-of-concrete-structures-spring-2004/lecture-notes/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
AVG	3	2

JCE1503	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the methods of sub soil investigation.
- To study the various types of shallow foundations.
- To gain knowledge on the various footings and its applications.
- To acquire knowledge on pile foundations.
- To grasp knowledge on retaining wall structures.

.UNIT I SITE INVESTIGATION 9

Scope and objectives –Methods of exploration –auguring and boring –Wash boring and rotary drilling –Depth of boring –Spacing of bore hole –Sampling techniques – Representative and undisturbed sampling – methods - Split spoon sampler, Thin wall sampler, Stationery piston sampler –Penetration tests (SPT and SCPT) - Bore log report – Data interpretation - Bearing capacity from in-situ tests (SPT, SCPT and plate load)Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. - Selection of foundation based on soil condition- Case study of SPT with practical report.

UNIT II SHALLOW FOUNDATION 9

Types of foundation –Location and depth of foundation –Types of failure- Codal provisions – bearing capacity of shallow foundation on homogeneous deposits –Terzaghi's formula - derivation- BIS formula –Factors affecting bearing capacity – problems – 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 footings –Contact pressure distribution-Isolated footing –Combined footings-Rectangular footing- Trapezoidal footing –Types and proportioning –Mat foundation – Types and applications –Proportioning –Floating foundation –Seismic force consideration-Codal Provision.

UNIT IV PILE FOUNDATION **9**

Types of piles and their function –Factors influencing the selection of pile –Carrying capacity of single pile in granular and cohesive soil –Static formula –dynamic formulae (Engineering news and Hileys) –Negative skin friction –uplift capacity-Group capacity by different methods (Feld's rule, Converse –Labarra formula and block failure criterion)-Cohesive and Cohesionless soil – Settlement of pile groups –Interpretation of pile load test (routine test only) –Under reamed piles - Capacity under compression and uplift.

UNIT V RETAINING WALLS **9**

Plastic equilibrium in soils –active and passive states –Rankine's theory- Derivation –At rest condition- cohesion less 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 –Taylor's Stability number-Stability analysis of retaining walls.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the methods of sub soil investigation.
- Demonstrate the types of shallow foundations.
- Summarize the various types of footings and their applications.
- Explain the types of piles foundation and their function.
- Analyze the earth pressure on retaining wall structures.

TEXT BOOKS:

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2007.
2. Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International Pvt. Ltd, New Delhi, 2005.
3. Purushothama Raj. P., "Soil Mechanics 2nd Edition, Pearson Education, 2013.

REFERENCES:

1. Das, B.M. "Principles of Foundation Engineering" 5thedition, Thompson Asia Pvt. Ltd., Singapore, 2003.
2. Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., New Delhi,2005.
3. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2007.
4. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005.
5. IS 6403 : 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureau of Indian Standards, New Delhi, 1998.

WEBREFERENCES:

1. https://nptel.ac.in/courses/105/105/105105176/
2. https://nptel.ac.in/courses/105/101/105101083/
3. https://nptel.ac.in/courses/105/108/105108069/
4. https://nptel.ac.in/courses/105/105/105105185/
5. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-364- advanced-geotechnical-engineering-fall-2003/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE1504	WATER SUPPLY ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the sources of water and its demand.
- To impart knowledge on collection and conveyance of water supply system.
- To acquire adequate knowledge on water treatment processes.
- To gain knowledge on recent advances in water treatment.
- To study the water distribution networks and water supply for buildings.

UNIT I SOURCES AND QUALITY OF WATER 9

Public water supply system – Planning, Objectives, Design period, Population forecasting –Water demand – Factors affecting rate of demand - Sources of water and their characteristics - Surface and Groundwater – Impounding Reservoir – Development and selection of source - Water quality - Quality at source – Water analysis – Physical, chemical and biological characteristics andtheir tests – Significance – Drinking Water quality standards.

UNIT II COLLECTION AND CONVEYANCE OF WATER 9

Water supply – Intake structures - Types and design aspects of intake structures –Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – Pipe appurtenances – Types and capacity of pumps – Selection of pumps – Power requirements of pumps.

UNIT III CONVENTIONAL WATER TREATMENT 9

Objectives – Unit operations and processes - Principles, functions, and design of water treatment plant units - Screens and Grit chamber - Aerators and flash mixers - Coagulation and flocculation - Clarifloccuator - Plate and tube settlers - Pulsator clarifier - Sand filters - Disinfection – Residue Management – Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT 9

Water softening - Iron and Manganese removal - Defluoridation - Adsorption - Desalination- R.O. Plant – Demineralization process –Ion exchange– Membrane filtration – RO Reject Management – Oxidation processes (Tertiary Treatment) - Operation & Maintenance aspects.

UNIT V WATER DISTRIBUTION AND SUPPLY 9

Requirements of water distribution – Methods of water distribution – Systems of water supply -Storage and distribution reservoirs – Types – Layouts of distribution system - Pipe appurtenances– Leak detection - Principles and design of water supply in buildings – House service connection - Operation and maintenance of water supply to buildings – Rural water supply – Protectedwater supply– Fixtures and fittings, systems of plumbing and types of plumbing – Digital Water Supply

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the various components of water supply scheme.
- Design the intake structure and conveyance system for water transmission.
- Demonstrate the process of conventional treatment of water and design of water treatment system.
- Summarize the various advances in water treatment processes.
- Evaluate and design the water distribution system and water supply for buildings.

TEXT BOOKS:

1. Garg, S.K. "Environmental Engineering", Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., "Water Supply Engineering", Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C.,Ashok Jain and Arun Jain, "Water Supply Engineering", Laxmi Publications (P) Ltd., New Delhi, 2010.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development,Government of India, New Delhi, 2013.
2. Subhash Verma, Varinder Kanwar & Siby John ,"Water Supply Engineering",Vikas Publishing House(P) LTD, 2015.
3. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning,Design and Operation", Prentice Hall of India Learning Private Limited, New Delhi, 2009.
4. Venugopal Rao,P, "Environmental Engineering", Prentice Hall of India Private Limited,NewDelhi,2005.
5. Birdie, G. S. and Birdie, "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons,2014.

WEBSITE REFERENCES:

1. https://ocw.mit.edu/courses/civil-and-environment engineering/
2. https://nptel.ac.in/courses/105/105/105105201/
3. https://nptel.ac.in/courses/105/104/105104102/
4. https://www.twadboard.tn.gov.in/
5. https://cpheeo.gov.in/cms/water-supply--and-sanitation-services.php

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
AVG	3	3

JCE1511	CONSTRUCTION MATERIALS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To gain knowledge on material selection through the material testing.
- To learn the properties of construction materials.
- To study the properties of fine and coarse aggregate.
- To study the properties of fresh and hardened concrete.
- To study the strength of bricks and blocks.

I. TEST ON FINE AGGREGATES **6**

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

II. TEST ON COARSE AGGREGATE **10**

1. Determination of moisture content
2. Determination of impact value of coarse aggregate
3. Determination of elongation index
4. Determination of flakiness index
5. Determination of aggregate crushing value of coarse aggregate

III. TEST ON CONCRETE **10**

1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength – Cube & Cylinder
4. Test for Permeability

IV. TEST ON BRICKS AND BLOCKS **4**

1. Test for compressive strength of bricks and blocks
2. Test for Water absorption of bricks and blocks

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Summarize the procedure for various testing of construction materials.
- Find the grading, specific gravity and density of fine aggregate.
- Determine the specific gravity, impact value, crushing value, elongation and flakiness index of coarse aggregate.
- Analyze the properties of fresh concrete and hardened concrete.
- Analyze the properties of bricks and blocks.

TEXTBOOKS:

1. Varghese, P.C, "Building Materials",PHI Learning Pvt. Ltd, New Delhi,2015.
2. Rajput, R.K, "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Gambhir, M.L,"Concrete Technology",3rd Edition,Tata McGraw Hill Education, 2004.

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1. Duggal,S.K, "Building Materials", 4thEdition, New Age International, 2008.
2. Bibhuti,B.Das, Narayanan.N,"Sustainable Construction and Building Materials", Springer,2018.
3. Jagadish,K.S,"Alternative Building Materials Technology",New Age International,2007.
4. Ravindra, K.Dhir, O.B.E, Jorgede Brito, Rui,V.S., Chao Q.L, "Sustainable Construction Materials: Recycled Aggregates", Woodhead Publishing,2019.
5. Gambhir, M.L,Neha Jamwal, "Building Materials, products, properties and systems",Tata McGraw Hill Educations Pvt.Ltd, New Delhi,2012.

IS CODE BOOKS:

1. IS456-2000: Indian Standard specification for plain and reinforced concrete, 2011.
2. IS4926-2003: Indian Standard specification for ready – mixed concrete, 2012.
3. IS383-1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011.
4. IS 1542-1992: Indian standard specification for sand for plaster,2009.
5. IS10262-2009: Indian Standard Concrete Mix Proportioning - Guidelines, 2009.

WEBSITE REFERENCES:

1. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-103-civil-engineering-materials-laboratory-spring-2004/index.htm
2. https://nptel.ac.in/courses/105/101/105101160/
3. https://ts-nitk.vlabs.ac.in/transportation-engineering/List%20of%20experiments.html
4. http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Marine_Structures_Lab/experimentlist.html

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
AVG	3	3

JHS1511	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enable students to acquire a specialized knowledge of the essential professional skills
- To train them to make effective presentations on a variety of topics
- To help them participate in group discussions displaying team work skills
- To build their confidence and help them attend interviews winningly
- To groom them to become successful professionals

UNIT I EXPOSURE TO PROFESSIONAL SKILLS 6

Introduction to Skills: hard skills and soft skills – communication skills – interpersonal skills – employability and career skills – planning and prioritizing work – time management – stress management– emotional intelligence –SWOT analysis

UNIT II P REPARING AND PRESENTING INSPIRING TALKS 6

Key elements of effective presentation – non verbal communication – impressive self-introduction and short individual presentation – preparing outline – structuring and 93rganizing content –presenting– introducing topic –developing points– concluding– answering questions

UNIT III MEASURES TO CRACK GROUP DISCUSSION 6

Group discussion skills – team building – using key strategies – etiquette – content preparation –brain storming – out of box thinking – mind mapping – turn taking and turn giving – speaking persuasively– questioning and clarifying

UNIT IV INTERVIEW SKILLS TO GET HIRED 6

Interview skills – etiquette – body language – confidence – preparedness – types of interview – Frequently Asked Questions (FAQs)–mock interview– job application and resume writing

UNITV LANGUAGE SKILLS AND CAREER MAPPING 6

Listening skills–understanding different accents–reading skills–verbal ability–email writing – professional grooming –leadership qualities – fundamentals of entrepreneurship–career planning–goal setting–future challenges

TOTAL:30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To have sufficient knowledge of the skills required for professional development
CO2: To give formal and effective presentations
CO3: To participate actively in group discussions
CO4: To attend job interviews and answer questions confidently and effortlessly
CO5: To emerge as professionals ready for placement

RECOMMENDED SOFTWARE:

1. Globe arena
2. Win English

TEXTBOOK:

Inter act English Lab Manual for Undergraduate Students, 2016, Hyderabad: Orient Black Swan.

REFERENCE BOOKS:

1. Alex .K, 2019,Soft Skills: Know Yourself and Know the World, New Delhi: S. Chand &Company Limited.
2. Butter field, Jeff, 2015, Soft Skills for Everyone. New Delhi: C engage Learning.
3. Kumar, Suresh E et al, 2015, Communication for Professional Success, Hyderabad: OrientBlack Swan.
4. Mitra, Barun K, 2016, Personality Development and Soft Skills, New Delhi : Oxford University Press.
5. Raman, Meenakshi and Sangeeta Sharma, 2014, Professional Communication Oxford University Press.
6. Rizvi, Ashraf, M, 2018, Effective Technical Communication, Chennai: McGraw-Hill Education.

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1. https://www.britishcouncil.in/english/online/resources-websites/moocs
2. https://alison.com/courses/communications
3. https://in.topresume.com/career-advice/15-free-resources-to-improve-your-presentation- and-speaking-skills
4. http://www.washington.edu/doit/TeamN/present_tips.html
5. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
6. http://www.oxforddictionaries.com/words/writing-job-applications
7. http://www.mindtools.com/pages/article/newCDV_34.htm
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CO-PO MAPPING:

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

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	-	-	-
CO3	3	-	-
CO4	2	-	-
CO5	3	-	-
AVG	2	-	-

JPT1002	TECHNICAL SKILLS AND APTITUDE I	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES:

- To make students analyze and solve problems in technical as well as quantitative aptitude.
- To enhance the Technical skills and basics of programming language
- To make students understand how to apply the practical knowledge with real time applications.
- To make students think and draw a conclusion from different scenarios.
- To help students understand python programming concepts

UNIT I OOPS CONCEPTS 6

What is object oriented programming?. Const and classes. Arrays and string arrays fundamentals. Arrays of object, string, The standard C++ String class. Operator overloading: Overloading unary operations. Concept of inheritance. Derived class and based class. Derived class constructors, member function, Virtual Function

UNIT II PYTHON I 6

Python interpreter and interactive mode; values and types: into, float, boolean, string, and list; variables, expressions, statements, tuple assignment, modules and functions.

UNIT III PYTHON II 6

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, list parameters; Tuples: tuple assignment, Dictionaries: operations and methods; advanced list processing–list comprehension

UNIT IV QUANTITATIVE APTITUDE 6

Boats and streams–Time and work–Pipes and Cistern–Time and distance–Problems on Trains

UNIT V LOGICAL REASONING 6

Syllogism – Statement and Conclusion – Inequalities – Non Verbal Reasoning – Figure Analogy – Mirror and Water images – Paper cutting and Folding – Cubes and Dices – Pattern completion.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Apply OOPS concepts in applications
CO2: To enhance knowledge in python programming.
CO3: Gain knowledge in coding using the python programming.
CO4 : Solve complex arithmetic problems practically with real time applications.
CO5 : Think logically in solving problems, enhance decision making, for difficult situations.

TEXTBOOKS:

1. Dr. E. Balagurusamy, "Programming in C++" complete reference 8th Edition.
2. "The Complete Reference Python", Herbert schildt., McGraw HillEducation, 2011.
3. Python: The Complete Reference by Martin Brown and Martin C. Brown Published in 2014.
4. Python in a nut shell by Alex Martelli Revised in March 2013.
5. Dr.R.S Agrawal, "Quantitative Aptitude" and Non Verbal Reasoning published in 2000.

WEB REFERENCES:

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- https://m4maths.com/placement-puzzles.php
- www.freshersworld.com
- www.careerride.com
- www.youtube.com/watch/python
- www.youtube.com/watch/conceptsofpython
- https://stackoverflow.com/
- https://www.w3schools.com/
- https://www.geeksforgeeks.org/

CO-PO MAPPING:

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

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	2	-	-
CO5	-	-	-
AVG	1	-	-

JCE1551	SURVEY CAMP	L	T	P	C
		0	0	0	1

COURSE OBJECTIVES:

- To provide practical knowledge for implementation of different survey works.
- To facilitate handling of different surveying instruments.
- To impart knowledge on the surveying techniques in field to establish vertical control networks.
- To study the different survey adjustment techniques. To gainknowledge on setting out curves.

Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse- using Total station
2. Contouring
   I. Radial tachometric contouring-Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line
   II. Block Level/ By squares of size at least 100 Meter x 100 Meter at least 20 Meter interval
   III. L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter at least L.S at Every 30M and C.S at every 90 M
3. Offset of Buildings and Plotting the Location
4. Sun observation to determine azimuth (guidelines to be given to the students)
5. Use of GPS to determine latitude and longitude and locate the survey camp location
6. Traversing using GPS
7. Curve setting by deflection angle

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Practice handling of different survey instruments.
- Apply modern surveying techniques in field to establish horizontal control.
- Practice the surveying techniques in field to establish vertical control networks.
- Rectify the common errors and conventional errors occurring in survey equipments.
- Sketch curve setting out work for alignment.

REFERENCES:

1. Russell,C, Brinker, Roy M, "The Surveying Handbook", Springer Science &Business Media,
2. Colonel, H. L,Thuiller,Lt .Colonel,R. Symth.,"A Manual of Surveying for India", Thacker Spink and Company, 1875.

WEBSITE REFERENCES:

1. https://ctt.mtu.edu/sites/default/files/flyers/Surveying%20manual.pdf
2. https://nptel.ac.in/courses/105/107/105107158/
3. http://www.vlab.co.in/ba-nptel-labs-civil-engineering

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

SEMESTER VI

JCE1601	IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the concept of soil-plant characteristics and their water requirements.
- To impart knowledge on estimation of crop water.
- To acquire knowledge on design the various type of hydraulic structures.
- To gain knowledge on irrigation canals and cross drainage works.
- To grasp knowledge on Irrigation water management.

UNIT I IRRIGATION OF PRINCIPLES 9

Need for irrigation – Advantages and ill effects – Development of irrigation – National Water Policy – Tamil Nadu scenario - Physical properties of soil that influence soil moisture characteristics – Concept of soil water potential and its components: Gravitational and Osmotic pressures- Retention of water in soils - Concept of available water – Movement of water into and within the soils – Measurement of soil moisture content.

UNIT II CROP WATER REQUIREMENT 9

Necessity and importance– Crop and crop seasons in India –Duty, Delta, Base Period– Factors affecting Duty-Irrigation efficiencies– Consumptive use of water-Irrigation requirements of crops - Standards for irrigation water- Planning and Development of irrigation projects.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Head works –Weirs and Barrages –Types of impounding structures - Factors affecting, location of dams -Forces on a dam -Design of Gravity dams; Earth dams, Arch dams – Spillways – Energy dissipaters.

UNIT IV CANAL IRRIGATION 9

Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories - Canal Head works – Canal regulators - Canal drops – Cross drainage works – Canal Outlets, Escapes –Lining and maintenance of canals – Other methods of Irrigation: Surface, Subsurface –Merits and Demerits - River Training works.

UNIT V IRRIGATION WATER MANAGEMENT 9

Modernization techniques – Rehabilitation – Command Area Development - Systems of rice intensification - Water delivery systems - Participatory Irrigation Management – Farmers' organization and turn over – Water users' associations - Economic aspects of irrigation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Illustrate the national water policy structure and soil plant water characteristics.
- Estimate the crop water of irrigation.
- Design the various types of hydraulic structures.
- Demonstrate the components of irrigation canal and cross drainage works.
- Summarize the Irrigation water management and water user association for participatory irrigation management.

TEXT BOOKS:

1. Sharma S.K "Irrigation Engineering and Hydraulic Structures", S. Chand Publishing, 2017
2. Garg, S.K., "Irrigation Engineering" Laxmi Publications, New Delhi, 2008
3. Michael, A.M., "Irrigation Engineering", Vikas Publishers, New Delhi, 2008.

REFERENCES:

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, New Delhi, 2009.
2. Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.
3. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi,2008.
4. Punmia, B.C., "Irrigation and Water Power Engineering", Laxmi Publishers, New Delhi, 2008.
5. Sharma, R.K., and Sharma, T.K., "Irrigation Engineering", S. Chand and Company, New Delhi, 2008

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2. https://nptel.ac.in/courses/126/105/126105010/
3. http://ecoursesonline.iasri.res.in/course/view.php?id=511
4. https://www.twadboard.tn.gov.in/
5. http://www.wrd.tn.gov.in/Dams.html

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	1	3
CO3	3	3
CO4	3	3
CO5	1	3
AVG	2	3

JCE1602	WASTEWATER ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basics of sewage composition and its characteristics.
- To impart knowledge on unit operations and processes that are used in sewage treatment.
- To study the design of various secondary treatment units.
- To acquire knowledge on recent advances in sewage treatment process.
- To gain knowledge on sewage disposal and management.

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM 9

Characteristics and composition of sewage-- population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design - Storm runoff estimation – sewer appurtenances – sewage pumping-drainage in buildings-plumbing systems for drainage- Discharge standards for Effluents.

UNIT II PRIMARY TREATMENT OF SEWAGE 9

Objectives – Unit Operations and Processes – Selection of treatment processes –- Onsite sanitation - Septic tank - Design and effluent disposal in septic tanks - Primary treatment – Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks –Operation and Maintenance aspects.

UNIT III SECONDARY TREATMENT OF SEWAGE 9

Objectives – Selection of Treatment Methods – Principles, Functions, - Activated Sludge Process - Aeration units - Trickling filters - Design of low rate and high rate trickling filters - Waste Stabilization Ponds – Aerated lagoons - Rotating biological contactors - Operation and Maintenance.

UNIT IV ADVANCES IN SEWAGE TREATMENT 9

Sequencing Batch Reactor –Moving bed bio-film reactor - Membrane Bioreactor – Up flow anaerobic sludge blanket reactor - Biogas recovery- Reclamation and Reuse of sewage – Constructed Wetland —Nutrient removal systems – Biological degradation – Advanced oxidation processes.

UNIT-V SEWAGE DISPOSAL AND SLUDGE MANAGEMENT 9

Dilution – Self-purification of surface water bodies Oxygen sag curve – deoxygenation and reaeration - Land disposal – Sewage farming – sodium hazards - Soil dispersion system. Objectives - Sludge characterization – Sludge treatment processes - Sludge Thickening – Dewatering – Drying - ultimate residue disposal – Sewage Management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations
- Select type of treatment system and able to perform basic design of the unit operations that are used in sewage treatment. Knowledge of septic tank design.
- Demonstrate the selection of treatment process and biological treatment process.
- Explain the advanced treatment technology and reuse of sewage
- Summarize the self-purification of streams and sludge and sewage disposal methods.

TEXT BOOKS:

1. Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" Chand and Co. Ltd., New Delhi, 2014.
3. Punmia, B.C., Jain, A.K., and Jain.A.K.., "Environmental Engineering", Vol.II, Laxmi Publications, 2010.

REFERENCES:

1. Metcalf and Eddy- "Wastewater Engineering–Treatment and Reuse", Tata Mc.Graw-Hill Company, New Delhi, 2010.
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010
4. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.
5. Peavy H. S., Rowe D. R. and Tchobanoglous G., "Environmental Engineering", McGraw Hill, New York, 1985.

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2. https://nptel.ac.in/courses/105/105/105105178/
3. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/
4. https://www.twadboard.tn.gov.in/
5. http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	2
CO4	3	2
CO5	3	3
AVG	3	3

JCE1603	DESIGN OF STEEL STRUCTURES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To impart a knowledge on loading and load combinations.
- To study the design of tension members subjected to axial tension and bending.
- To learn the design of columns and slab bases.
- To acquire knowledge on the design of laterally supported and unsupported beams.
- To gain knowledge on roof trusses and industrial structures.

UNIT I INTRODUCTION TO STEEL STRUCTURAL ELEMENTS 9

Properties of structural steel, Rolled steel sections as per IS specifications, factor of safety. Limit state design of Connections: welded and bolted connections, design of fillet and butt weld, eccentric connections, efficiency of joints, high tension bolts

UNIT II TENSION MEMBERS 9

Net Sectional Area, Permissible Stress, Design of Axially Loaded Tension Member, Design of Member Subjected to Axial Tension and Bending- Lug angle.

UNIT III COMPRESSION MEMBERS 9

Column: Modes of Failure of a Column, Buckling Failure: Euler's Theory –Rankine's theory-Effective Length, Slenderness Ratio-Design of Compression Members, Design of Built-Up Compression Members: Laced and Battened Columns, Design of column splice- Design of slab base and gusset base and grillage foundation along with its connection with column.

UNIT IV DESIGN OF BEAM 9

Introduction, beam type, section classification, lateral stability of beam, lateral torsional buckling of symmetrical section, design strength of beam (Laterally supported and unsupported), shear strength and deflection, web buckling and web crippling.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 9

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; end bearing – Design of gantry girder.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the different type of joints and connections.
- Design the axial loaded tension members.
- Design the compression members and slab bases.
- Design the laterally supported and unsupported beams.
- Design the roof trusses and gantry girder.

TEXT BOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013.
3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.

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1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
2. Sai Ram. K.S. "Design of Steel Structures " Dorling Kindersley (India) Pvt. Ltd., New Delhi,2nd Edition, 2015.
3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
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5. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-051-structural-engineering-design-fall-2003/lecture-notes/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	3
AVG	3	2

JCE1604	TRANSPORTATION SYSTEM ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the planning and designing principles of pavement.
- To acquire knowledge on railway route alignment and maintenance.
- To learn the planning and design principles of Airports.
- To study the various structures in Harbour.
- To gain knowledge on urban and transportation management.

UNIT I HIGHWAY PLANNING AND DESIGN 9

History of road development in India – Classification of highways — highway alignment – Engineering surveys for alignment — Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 9

Elements of permanent way - 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. Earthwork

– Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities - Signaling.

UNIT III AIRPORT DESIGN 9

Airport classification - air port planning - Typical airport layouts - Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Runway and Taxiway Markings and lighting.

UNIT IV HARBOUR ENGINEERING 9

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour 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 – Coastal Regulation Zone.

UNIT V URBAN TRANSPORTATION MANAGEMENT 9

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 –Intelligent Transportation System – Multimodal transport system.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe geometric design of highways and to design the pavements.
- Demonstrate the elements in railways tracks.
- Describe planning and site selection of Airport.
- Explain the various features in Harbors and Ports.
- Demonstrate the urban growth and management of transport infrastructure.

TEXT BOOKS :

1. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat RaiandSons, Delhi, 2003.
2. Satish Chandra and Agarwal M.M, "Railway Engineering", 2nd Edition, Oxford UniversityPress, New Delhi, 2013.
3. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.

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3. https://nptel.ac.in/courses/105/107/105107123/
4. https://www.coursera.org/lecture/supply-chain-principles/railroad-freight-movement-stFVC
5. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar05/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE1611	ENVIRONMENTAL AND IRRIGATION ENGINEERING DRAWING	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To introduce the fundamental principles of irrigation and environmental drawing.
- To learn the design and drawings of various irrigation impounding structures.
- To acquire knowledge in design and drawings of cross drainage and regulatory structures.
- To learn the design and drawings of water supply and treatment plant structures.
- To learn the design and drawings of wastewater treatment plant structures.

PART A: IRRIGATION ENGINEERING 15

1. TANK COMPONENTS

Fundamentals of design - Tank surplus weir – Drawings showing foundation details, plan and elevation

2. IMPOUNDING STRUCTURES

Design principles - Earth dam – Profile of Gravity Dam

3. CROSS DRAINAGE WORKS

General design principles - Syphon aqueduct (Type III) – Drawing showing plan, elevation and foundation details.

4. CANAL REGULATION STRUCTURES

General Principles - Canal regulator - Drawing showing detailed plan, elevation and foundation details.

PART B: ENVIRONMENTAL ENGINEERING

1. WATER SUPPLY AND TREATMENT 6

Design and Drawing of flash mixer, clari- flocculator – Rapid sand filter– Houseservice connection for water supply and drainage.

2. SEWAGE TREATMENT & DISPOSAL 9

Design and Drawing of screen chamber - Grit channel - Activated sludge process- Trickling filter – Sludge digester – Septic tanks and disposal arrangements.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the fundamental principles of irrigation and environmental drawings.
- Design and draw the various impounding structures.
- Design and draw the cross drainage and regulation works.
- Design and draw the various units of municipal water treatment plants.
- Design and draw the various units of sewage treatment plants.

TEXTBOOKS:

1. Satya Narayana Murthy Challa, "Water Resources Engineering: Principles and Practice", New Age International Publishers, New Delhi, 2002.
2. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
3. Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill,New Delhi, 2010.

REFERENCES:

1. Qasim, S.R., Motley, E.M and Zhu.G. "Water works Engineering – Planning, Design and Operation", Prentice Hall, New Delhi, 2009.
2. Raghunath, H.M. “Irrigation Engineering”, Wiley India Pvt. Ltd., New Delhi, 2011.
3. Peary, H.S., ROWE, D.R., Tchobanoglous, G., “Environmental Engineering”, McGraw-Hill Book Co., New Delhi, 1995.
4. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
5. Manual on “Sewerage and Sewage Treatment Systems- Part A, B and C” CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.

WEBSITE REFERENCES:

1. https://nptel.ac.in/courses/105/105/105105110/
2. https://nptel.ac.in/courses/126/105/126105010/
3. http://ecoursesonline.iasri.res.in/course/view.php?id=511
4. https://www.twadboard.tn.gov.in/
5. http://www.wrd.tn.gov.in/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE 1612	WATER AND WASTEWATER ANALYSIS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To acquire knowledge on various sampling and preservation methods.
- To analyze the physical, chemical characteristics of water and wastewater.
- To quantify the dosage requirement for coagulation process.
- To quantify the amount of chlorine.
- To acquire knowledge on the detection of heavy metals.

LIST OF EXPERIMENTS:

ANALYSIS OF WATER SAMPLE

1. Sampling and preservation methods for water and wastewater (Demo only)
2. Measurement of pH, Electrical conductivity and turbidity
3. Determination of fluoride in water by spectro photometric method /ISE
4. Determination of Hardness in water
5. Determination of Sulphate in water
6. Determination of Optimum Coagulant Dosage
7. Determination of available Chlorine in Bleaching powder and residual chlorine in water
8. Determination of iron in water (Demo only)
9. Determination of heavy metals present in water (Demo Only)

ANALYSIS OF WASTEWATER SAMPLE

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

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Description of Equipment	Quantity
1	pH METER	2
2	Nephelometer	2
3	Conductivity Meter	1
4	UV And Visible Spectrophotometer	1
5	Jar Test Apparatus	1
6	Do Meter	1
7	BOD Incubator	1
8	COD Digestor With Heating Mantle	1
9	Hot Air Oven	1

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Quantify the pollutant concentration in water and wastewater.
- Suggest the type of treatment required and amount of dosage required for the treatment.
- Calibrate and standardize the equipment.
- Collect proper sample for analysis.
- Perform field-oriented testing of water and wastewater.

REFERENCES:

1. APHA, "Standard Methods for the Examination of Water and Wastewater", 22nd Edition .Washington, 2012.
2. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist, H. – Second Edition, VCH, Germany, 3rd Edition, 1999.
3. IS 3025-1 (1987): Methods of sampling and test (physical and chemical) for water and wastewater Part 1 – Sampling.

WEBSITE REFERENCES:

1. http://www.vlab.co.in/ba-nptel-labs-civil-engineering
2. https://web.iitd.ac.in/~arunku/files/CVL212_Y15/Lab_CVL212v1.pdf
3. https://jecassam.ac.in/engineering/civil/laboratories/environmental-engineering-laboratory/

CO-PO MAPPING

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

CO-PSO MAPPING - WATER AND WASTEWATER ANALYSIS LABORATORY

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	1	3
CO5	1	3
AVG	1	3

JPT1002	TECHNICAL SKILLS AND APTITUDE II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To make students analyze and solve problems in technical as well as quantitativeaptitude. Enhance the technical skills and basics of programming language
- To make the students understand how to apply the practical knowledge inreal time applications.
- To make the students think and draw conclusions from different scenarios.
- To help the students understand JAVA programming concepts
- To help the students understand concepts and develop new applications in JAVA

UNIT I JAVA FUNDAMENTALS 6

OOP in Java–Characteristics of Java–Java Source-File-Structure–Compilation. Fundamental Programming Structures in Java.

UNIT II ADVANCED JAVA PROGRAMMING 6

Defining classes in Java–constructors, methods-access specifies–static members- Data Types, Variables, Operators, Control Flow, Arrays, Inheritance–Super classes- sub classes–Protected members–constructors in sub classes- Inter faces–Strings.

UNIT III MATHEMATICAL AND ARITHMATIC PROBLEM SOLVING 6

Crypto arithmetic Problem Solving, Logarithms, Trigonometry, Menstruation, Probability,Permutations and Combinations.

UNIT IV LOGICAL REASONING - COGNITIVE THINKING 6

Numerical Ability, English Ability, Gaming, Arrangements, Visual Reasoning, Flowcharts –Visual Reasoning–DI.

UNIT V LOGICAL REASONING - CRITICAL THINKING 6

Logical Sequence, Inferred Meaning, Agree Disagree Psychometric, Statement & Conclusions,Cubes and Cuboids. **TOTAL: 30 PERIODS**

CO-PO MAPPING:

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

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-
AVG	1	-	-

SEMESTER-VII

JCE1701	ESTIMATION AND QUANTITY SURVEYING	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES

- To understand the fundamental to estimate the quantities of item of works involved in buildings
- To estimate the quantities of item of works involved in water supply and sanitary works, road works and irrigation works.
- To enrich students about specifications in tenders.
- To expose students about valuation of buildings.
- To illustrate use of report preparation.
-

UNIT I ESTIMATE OF BUILDINGS 9

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, color washing and painting / varnishing for shops, rooms, Single residential building- with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches –Estimate of joineries for paneled and glazed doors, windows, ventilators, handrails etc

UNIT II ESTIMATE OF OTHER STRUCTURES 9

Estimating of septic tank for 25 and 50 users, soak pit – sanitary and water supply installations – water supply pipe line –sewer line – tube well – open well – Estimate of bituminous and cement concrete roads – estimate of retaining walls–Culverts.

UNIT III SPECIFICATION AND TENDERS 9

Data – Schedule of rates – Analysis of rates – Specifications – sources – Preparation of detailed and general specifications – Tenders – Necessity of tender - TTT Act – e-tender – Preparation of Tender Notice and Document –Contracts –Types of contracts–Drafting of contract documents–Arbitration and legal requirements- Powers of arbitrators.

UNIT IV VALUATION 9

Necessity – Basics of value engineering – Capitalized value – Depreciation – Escalation – Value of building– Calculation of Standard rent– Mortgage–Lease

UNITV REPORT PREPARATION **9**

Principles for report preparation–Valuation report-Report on estimate of residential building–Culvert–Roads–Water supply and sanitary installations– Tube wells – Open wells.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- Describe the fundamentals to estimate the quantities of item of works involved in buildings
- Estimate the quantities of item of works involved in water supply and sanitary works, road works and irrigation works.
- Describe the specifications in tenders.
- Analyze valuation of buildings.
- Comprehend Principles for report preparation.

TEXT BOOKS:

1. Dutta,B.N.," Estimating and Costing in Civil Engineering", UBS Publishers & Distributors,Pvt.Ltd.,2003.
2. Kohli,D.D and Kohli,R.C., "A Text Book of Estimating and Costing(Civil)",S.Chand & Company Ltd.,2004.

REFERENCES:

1. PWD Data Book,1972
2. TamilnaduTransparenciesinTenderAct,1998
3. Arbitration and ConciliationAct,1996
4. Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank,April1996.
5. Dr.P.Purushothamaraj,Dr.V.Rajendran.,"EstimationandQuantitySurveying",SriKrishna Hitech Publishing CompanyLtd.,2016.

WEBSITE REFERENCES:

1. Estimation of Building - Long Wall Short Wall, Center Line Method. (civilseek.com)
2. http://www.tnhighways.gov.in/pdf/PWD%20SOR-2016-17.pdf
3. http://www.tnpsc.gov.in/tender/tender_act.pdf
4. http://nptel.ac.in/courses/105103093/14
5. Report Preparation - Characteristics of a Good Report (managementstudyguide.com)

Mapping of PO with CO

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

Mapping of PSO with CO

CO\PSO	PSO1	PSO2
CO1	2	2
CO2	1	2
CO3	2	2
CO4	1	3
CO5	1	3
AVG	1	2

JCE1702	GEOSPATIAL TECHNOLOGY AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the fundamentals of geospatial technology, RS & GIS
- To identify and explore the various spatial data model
- To enrich students about geospatial techniques for developing rural area
- To expose students about handling of geospatial techniques for disaster management
- To illustrate use of geospatial tools in water and environmental engineering

UNIT I INTRODUCTION 9

Introduction to the fundamentals of Geospatial Technology – basics of Remote Sensing (RS) and Geographic Information System (GIS) - spatial analysis and its significance – overview of tools for analysis

UNIT II SPATIAL DATA MODEL 9

Vector Based: Overlay Operations: Point-in Polygon, Line-in-Polygon, and Polygon-in-Polygon - Single Layer Operations: Feature Identification, Extraction, and Classification Manipulation - Multilayer Operation: Union, Intersection, Symmetrical Difference, Update, Merge, Append and Dissolve Raster Based: Map Algebra, Grid Based Operations, Local, Focal, Zonal and Global Functions, Cost Surface Analysis, Optimal Path and Proximity Search

UNIT III GEOSPATIAL TECHNIQUES FOR RURAL DEVELOPMENT 9

Concepts of Rural Area and Rural Development; Causes of Rural Backwardness, Need for Rural Development, Levels of Living of Rural People Poverty indicators - Geospatial techniques for mapping of rural resources - Spatial technologies in rural planning management administration and development.

UNIT IV GEOSPATIAL TECHNIQUES FOR DISASTER MANAGEMENT 9

Various types of Natural Disasters - Cyclones, Floods and Tidal waves, Earth quakes, land subsidence and Landslides, Forest fires, Droughts - Solving Disaster Management - Challenges Using Remote Sensing, Web-GIS and Advanced Technologies, Implementation of Tsunami Information System using geospatial technologies - GIS for Emergency Management.

UNIT V GEOSPATIAL TECHNIQUES FOR WATER & ENVIRONMENTAL ENGINEERING 9

Geospatial techniques for planning and design of Water-Supply and Irrigation Systems, Spatial Database Development for Wastewater and Storm water Systems - GIS-Based Wastewater Collection System Design and Management Applications - GIS-Based Decision-Support Systems for Wastewater and Storm water Systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- Describe the fundamentals and basic concepts geospatial technology, RS & GIS
- Demonstrate basic proficiency in creation and acquisition of spatial data
- Apply geospatial tools for rural governance
- Identify and analyze geospatial techniques for disaster management
- Comprehend geospatial methods for water and environmental engineering.

TEXT BOOKS:

1. Burrough, P. A. and McDonnell, R.A. (2000): Principles of Geographical Information Systems, Oxford University Press, New York
2. Lo, C. P.Yeung, A. W.(2002): Concepts, Techniques of Geographical Information Systems, Prentice Hall of India, New Delhi
3. Lynn E. Johnson, Geographic Information Systems in Water Resources Engineering, CRC Press, 2008.
4. Allan Brimicombe, GIS, Environmental Modeling and Engineering, Second Edition, CRC Press, 2009.
5. Harekrishna Misra (ed.), Governance of Rural Information and Communication Technologies, Opportunities and Challenges, Academic Foundation, 2009.

REFERENCES:

1. Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York
2. Andrew Skidmore (Editor, Environmental Modeling with GIS and Remote Sensing, CRC Press), 2002.
3. D.B.N. Murthy - Disaster Management - Deep & Deep Publication, 2008.
4. Babar, Md., Environmental Changes and Natural Disasters, New India Publishing Agency, 2007.
5. Jain S.C. Indigenous Resources for Rural Development, Concept Publishers, 2005.

WEBSITE REFERENCES:

1. http://en.wikibooks.org/wiki/ Technologies for Rural Development
2. https://summeruniversity.ceu.edu/courses/introduction-geospatial-technologies-achieving-sdgs
3. https://onlinecourses.swayam2.ac.in/aic20_ge05
4. https://ongeo.msu.edu/courses/ongeo/igt.html
5. https://www.iirs.gov.in/Remote-Sensing-Geoinformatics

Mapping of PO with CO

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

Mapping of PSO with CO

CO\PSO	PSO1	PSO2
CO1	-	2
CO2	1	2
CO3	2	2
CO4	-	3
CO5	1	3
AVG	1	2

JNC1361	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

UNIT I INTRODUCTION TO TRADITIONAL KNOWLEDGE 6

Define traditional knowledge (TK), nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II PROTECTION OF TRADITIONAL KNOWLEDGE 6

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III LEGAL FRAME WORK AND TK Rights 6

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Act 2006, PlantVarieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT IV TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY 6

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS 6

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management ofbiodiversity, Food security of the country and protection of TK.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- To understand the concept of Traditional knowledge and its importance
- To know the need and importance of protecting traditional knowledge.
- To know the various enactments related to the protection of traditional knowledge.
- To understand the concepts of Intellectual property to protect the traditional knowledge.
- To know the applications of traditional knowledge in various fields.

REFERENCE BOOKS:

1. Amit Jha, "Traditional Knowledge System in India", 2009.
2. Basanta Kumar Mohanta and Vipin Kumar Singh, "Traditional Knowledge System and Technology in India", Pratibha Prakashan, 2012.
3. Amit Jha, "Traditional Knowledge System in India", Atlantic publishers,2002
4. Kapil Kapoor, MichelDanino, "Knowledge Traditions and Practices of India"

WEBSITE REFERENCES:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

CO - PO MAPPINGS

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

CO -PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1
AVG	1	1

JBA1711	ENTREPRENEURSHIP FOR ENGINEERS	L	T	P	C
		0	0	2	1

COURSEOBJECTIVES:

- To provide exposure on insight of entrepreneurship
- To investigate the feasibility study for the new venture.
- To identify the right process for successful business plan

Sl.No	LIST OF ACTIVITIES	No.of Periods
1	Insight of Entrepreneurship	1
2	Business Idea	1
3	Business sources	1
4	Business Plan	1
5	Financial Plan	1
6	Market Survey	2
7	Feasibility report	2
8	Case study	3
9	Entrepreneurship Que Card	2
10	Prevention of Sickness & Measures	1

TOTAL: 20 PERIODS

COURSE OUTCOMES:

Students will be able,

- To procure knowledge on setting up of new venture
- To draft and approval of financial plan and appraisal of new project
- To impart the knowledge of effectiveness of innovation in entrepreneurship

REFERENCES

1. Hisrich, Robert D.,Michael Peters and Dean Shepherded, Entrepreneurship,Tata Mc Graw Hill,2014.
2. SS.Khanka, Entrepreneurial Development, Third Edition,S.Chand&company,NewDelhi2001.
3. Srinivasan, Case Studies in marketing Indian context, sixth edition PHI learning privateLimited2014.
4. Lall, Madhurima, and Shikha Sahai, Entrepreneurship, Excel Book, NewDelhi. 2008.

WEBSITES:

1. https://ideadrop.co/innovation-management/top-five-favourite-idea-generationtechniques/
2. https://www.bajajfinserv.in/what-are-the-sources-of-finance-for-entrepreneurs
3. https://www.babson.edu/academics/undergraduate-school/core-experiences/foundations-of-management-and-entrepreneurship/
4. https://www.businessgig.com/business-plan-preparation
5. https://www.financierworldwide.com/the-impact-of-social-entrepreneurship-on-economic-growth

JCE1711	COMPUTER AIDED ANALYSIS AND DESIGN LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To familiarize students about the civil software's for analysis and design
- To analyze RCC and Steel Structural Elements
- To design RCC and Steel Structural Elements
- To interpret on the behaviour RCC and Steel Structural Elements

LIST OF EXPERIMENTS

1. Analysis and design of Plane RCC Frames
2. Analysis and design of Plane Steel Frames
3. Analysis and design of Roof Truss
4. Analysis and design of Overhead Water Tank
5. Analysis and design of Retaining Wall
6. Analysis and design of Box Culvert

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Analyze RCC and Steel Structural Elements using STAAD Pro
- Design RCC and Steel Structural Elements using STAAD Pro
- Report on the Behavior RCC and Steel Structural Elements using STAAD Pro

REFERENCES

1. IS – 456 (2000) Code of practice for plain and reinforced concrete
2. IS – 3370(2009) Part IV Code of practice for concrete (Part I to IV structures for storage of liquids
3. IS-800 Code – General Construction in Steel – Code of Practice
4. STAAD Pro Manual

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
AVG	-	2

JCE1731	PROJECT WORK -PHASE 1	L	T	P	C
		0	0	6	3

COURSE OBJECTIVES :

- To develop the ability to solve a specific problem right from its identification
- To review the literature till the successful solution of the same.
- To train the students in preparing project reports

The student works on a topic relevant to civil engineering under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Identify civil engineering problems reviewing available literature
- Identify appropriate techniques to analyze complex civil engineering problems
- Apply engineering and management principles through efficient handling of project

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
AVG	-	3

JCE1741	INTERNSHIP	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks.
- To develop skills in facing and solving the field problems

.

The students individually undertake training in reputed civil engineering companies for the duration of 2 weeks. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Implement textbook knowledge into practice
- Develop the concepts and implement new techniques

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	3	3	-	-	3	3	-	3
CO2	3	2	2	-	3	3	-	-	3	3	-	3
AVG	3	2	2	-	3	3	-	-	3	3	-	3

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
AVG	-	3

SEMESTER-VIII

JNC1861	INDIAN CONSTITUTION	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, election commission.

UNIT I INTRODUCTION TO INDIAN CONSTITUTION 6

Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II UNION GOVERNMENT AND ITS ADMINISTRATION 6

Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT III LOCAL ADMINISTRATION 6

A: Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

B: Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT IV CONCEPT AND DEVELOPMENT OF HUMAN RIGHTS 6

Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act,1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

UNIT V ELECTION COMMISSION 6

Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Know the sources, features and principles of Indian Constitution.
- Learn about Union Government, State government and its administration.
- Get acquainted with Local administration and Pachayati Raj.
- Be aware of basic concepts and developments of Human Rights.
- Gain knowledge on roles and functioning of Election Commission.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hallof India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

JCE1811	COMPREHENSIVE AND TECHNICAL SEMINAR	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enrich the communication skills of the student and presentations of technical topics of interest,
- To acquire the skills of oral presentation
- To acquire technical writing abilities for seminars and conferences.
- To develop the field oriented problems.
- To develop skills by reading of structural drawings.

The students will work for two hours per week guided by faculty members. They will be asked to present on any topic of their choice related to Civil Engineering and to engage in dialogue with the audience. A brief copy of their presentation should also be submitted. The students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will also answer the queries on the topic. The students as audience also should interact. Evaluation will be based on the technical presentation and the report and also on the interaction during the seminar.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- Acquire the skills of oral presentation
- Enhance technical writing abilities for seminars and conferences

JCE1841	PROJECT WORK -PHASE 2	L	T	P	C
		0	0	18	9

COURSE OBJECTIVES:

- To develop knowledge to formulate a real world problem and project's goals
- To identify the various tasks of the project to determine standard procedures
- To identify and learn new tools, algorithms and techniques
- To understand the various procedures for validation of the product and analysis the cost effectiveness.
- To understand the guideline to Prepare report for oral demonstrations

.

The student works on a topic relevant to civil engineering under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 265 PERIODS

COURSE OUTCOMES:

- Formulate a real world problem, identify the requirement and develop the design solutions
- Express the technical ideas, strategies and methodologies
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
- Test and validate through conformance of the developed prototype and analysis the cost effectiveness
- Prepare report and present the oral demonstrations

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JERUSALEM COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

DEPARTMENT OF CIVIL ENGINEERING

VERTICAL 1 CONSTRUCTION TECHNIQUES AND MANAGEMENT	VERTICAL 2 SURVEYING AND GEOGRAPHIC INFORMATION SYSTEM	VERTICAL 3 GEOTECHNICAL ENGINEERING	VERTICAL 4 ENVIRONMENTAL ENGINEERING	VERTICAL 5 HYDROLOGY AND WATER RESOURCES ENGINEERING	VERTICAL 6 STRUCTURAL ENGINEERING
JCE1001 Disaster Management	JCE1002 Advanced Surveying	JCE1006 Engineering Geology	JCE1005 Climate Change and its Impact	JCE1010 Surface Hydrology	JCE1016 Industrial Structures
JCE1003 Concrete Technology	JCE1034 Aerial Drone Surveying and Mapping	JCE1026 Introduction to Soil Dynamics and Machine Learning	JCE1013 Municipal Solid Waste Management	JCE1014 Groundwater Hydrology and Modeling	JCE1024 Repair and Rehabilitation of Structure
JCE1004 Construction Techniques and Practices	JCE1035 AI and Geo-Intelligence Using GIS	JCE1027 Geo Environmental Engineering	JCE1015 Environment and Social Impact Assessment	JCE1021 River Basin Management	JCE1020 Prestressed Concrete
JCE1009 Housing Planning and Management	JCE1036 Application of Geospatial Technology in Cyber Security	JCE1041 Remote Sensing	JCE1022 Industrial Wastewater Treatment	JCE1028 Integrated Water Resources Management	JCE1019 Structural Dynamics and Earthquake Engineering
JCE1030 Formwork Engineering	JCE1037 Application of GIS and Remote Sensing in Machine Learning	JCE1042 Earth and Earth Retaining Structures	JCE1046 Environmental Health and Safety	JCE1050 Groundwater Engineering	JCE1023 Tall Structures
JCE1031 Advanced Construction Techniques	JCE1038 Medical GIS	JCE1043 Pile Foundation	JCE1047 Environmental Policy and Legislation	JCE1051 Water Resource System Engineering	JCE1054 Finite Element Method
JCE1032 Construction Management and Safety	JCE1039 Geographical Information System in Coastal Engineering	JCE1044 Tunneling Engineering	JCE1048 Solid and Hazardous Waste Management	JCE1052 Watershed Conservation and Management	JCE1055 Prefabricated Structures
JCE1012 Construction Planning and Scheduling	JCE1040 Airborne and Terrestrial Laser Mapping	JCE1045 Rock Mechanics	JCE1049 Air and Noise Pollution Control Engineering	JCE1053 Water Quality and Management	JCE1056 Energy Efficient Buildings

VERTICAL 1 -CONSTRUCTION TECHNIQUES AND MANAGEMENT

JCE1001 Disaster Management

JCE1003 Concrete Technology

JCE1004 Construction Techniques and Practices

JCE1009 Housing Planning and Management

JCE1030 Formwork Engineering

JCE1031 Advanced Construction Techniques

JCE1032 Construction Management and Safety

JCE10I2 Construction Planning and Scheduling

JCE1001	DISASTER MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an exposure to disasters, their significance and types.
- To understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To acquire knowledge on various approaches of Disaster Risk Reduction (DRR).
- To enhance technological innovations in Disaster Risk Reduction.
- To develop rudimentary ability to respond to their surroundings with potential disaster response.

UNIT I INTRODUCTION TO DISASTERS **9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters - Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change - Dos and Don‟ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) **9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural - nonstructural measures, Roles and responsibilities of - community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake holders - Institutional Processes and Framework at State and Central Level - State Disaster Management Authority (SDMA) National Disaster Management Authority (NDMA) - Early Warning System - Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT **9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA **9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation - Role of Remote Sensing & GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster - Disaster Damage Assessment - Aerial and satellite technology.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Cyclone damage assessment - Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Illustrate various types of disasters and their significance.
CO2: Demonstrate the various approaches to disaster risk reduction.
CO3: Distinguish the relationship between vulnerability of development projects and disaster.
CO4: Explain the various disaster risk management.
CO5: Apply modern technology and field work of disaster management in various types of disaster.

TEXTBOOKS:

1. Singhal, J.P, "Disaster Management", Laxmi Publications, 2010.
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
3. Gupta A. K, Sreeja S. N, "Environmental Knowledge for Disaster Risk Management", NIDM, New Delhi, 2011.

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1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2. Government of India, National Disaster Management Policy, 2009.
3. Kapur Anu, "Vulnerable India: A Geographical Study of Disasters", IIA Sand Sage Publishers, New Delhi, 2010.
4. Angus M. Gunn, "Encyclopedia of Disasters - Environmental Catastrophes and Human Tragedies", Vol. 1 & 2, Greenwood Press, 2008.
5. Parag Diwan "A Manual on Disaster Management" Pentagon Press, 2010.

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3.https://ocw.mit.edu/courses/urban-studies-and-planning/11-941- disaster-vulnerability-and-resilience spring-2005/
4.https://reliefweb.int/sites/reliefweb.int/files/resources/102550-WP- P092217-P148868-OUO-9- Box394833B_0.pdf
5.http://healthindisasters.com/images/Books/Case_Studies_in_Disaster_Response_and Emergency Management.pdf

CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO 5	PO6	PO 7	PO 8	PO 9	PO10	PO1 1	PO12
CO1	3	3	1	1	-	1	1	1	1	2	1	2
CO2	3	3	1	1	-	1	1	1	1	2	1	2
CO3	3	3	1	1	-	1	1	1	1	2	1	2
CO4	3	3	1	1	-	1	1	1	1	2	1	2
CO5	3	3	1	1	-	1	1	1	1	2	1	2
AVG	3	3	1	1	-	1	1	1	1	2	1	2

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1003	CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the properties of ingredients of concrete.
- To learn different methods of concrete mix design.
- To gain knowledge on the behavior of concrete at its fresh and hardened state.
- To acquire knowledge on the procedures in concreting.
- To understand special concrete and its uses.

UNIT I CONSTITUENT MATERIALS **9**

Introduction - Concrete materials - Cement: Physical tests on cement - Concrete materials - Tests on aggregates - Quality of Water for mixing and curing - use of sea water for mixing concrete - Mineral and chemical Admixtures.

UNIT II 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 -Mix Design - factors influencing mix proportion - Mix design by ACI method and I.S. code method.

UNIT III FRESH AND HARDENED PROPERTIES OF CONCRETE **10**

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 - Quality control -Sampling and testing - Acceptance criteria.

UNIT IV SPECIAL CONCRETE **9**

Lightweight 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 - High volume fly ash concrete - Silica fume concrete.

UNIT V ADVANCED CONCRETING METHODS **8**

Process of manufacturing of concrete - methods of transportation, placing and curing Extreme weather concreting, special concreting methods - Vacuum dewatering - Underwater Concrete- mass concreting - Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Record all the concrete materials as per IS code.

CO2: Design the concrete mix using ACI and IS code methods.

CO3: Demonstrate the properties of fresh and hardened concrete.

CO4: Experiment special concrete in different building environments.

CO5: Apply advanced concreting methods in day to day construction.

TEXT BOOKS:

1. Shetty. M.S."Concrete Technology-Theory and Practice", S.Chand and Company, 2008.
2. Vidivelli. B, "Rehabilitation of Concrete Structures Standard Publishes Distribution",1st edition 2009.
3. John Newman, B. S. Choo, B.S, "Advanced Concrete Technology" Elsevier, 2003.

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1. Dov Kaminetzky, M.S, "Design and Construction Failures", Galgotia,Publications Pvt.Ltd.2001.
2. Ravishankar, K, Krishnamoorthy, T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
3. Handbook on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
4. Hand Book on "Repair and Rehabilitation of RCC Buildings" - Director General works CPWD, Govt of India, New Delhi -2002.
5. Zongjin, Li, "Advanced Concrete Technology" John Wiley & Sons, 2011.

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2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1- 054-mechanics and- design-of-concrete-structures-spring-2004/lecture-notes/
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4. https://www.nbmcw.com/tech-articles/concrete/38478-comparative-study- of-concrete mix- design-using-is-and-aci-methods-with-and-without-super-plasticizer.html
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CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO 9	PO10	PO1 1	PO12
CO1	3	3	3	3	-	1	1	1	1	2	1	2
CO2	3	3	3	3	-	1	1	1	1	2	1	2
CO3	3	3	3	3	-	1	1	1	1	2	1	2
CO4	3	3	3	3	-	1	1	1	1	2	1	2
CO5	3	3	3	3	-	1	1	1	1	2	1	2
AVG	3	3	3	3	-	1	1	1	1	2	1	2

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1004	CONSTRUCTION TECHNIQUES AND PRACTICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge on various construction techniques, practices and equipment.
- To learn various construction procedures for sub and super structure.
- To impart knowledge on equipment needed for construction of various types of structures from foundation to super structure.
- To apply different construction techniques in underwater construction.
- To introduce different types of equipment for construction.

UNIT I CONSTRUCTION TECHNIQUES **9**

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism –floor system - Development of construction techniques - High rise Building Technology - Natural Buildings - Passive buildings - Intelligent (Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones - Case studies of residential, office buildings and other buildings in each zones.

UNIT II CONSTRUCTION PRACTICES **9**

Specifications, details and sequence of activities and construction co-ordination - Site Clearance - Marking - Earthwork - masonry - stone masonry - concrete hollow block masonry - flooring - damp proof courses- laying brick - weather and water proof - roof finishes - construction joints - movement and expansion joints - pre cast pavements - Building foundations - basements - temporary shed - centering and shuttering- Scaffoldings - Slip forms.

UNIT III SUB STRUCTURE CONSTRUCTION **9**

Techniques of Box jacking - Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques - Piling techniques- driving well and caisson – Dewatering-well points - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls,sheet piles - shoring for deep cutting.

UNIT IV SUPERSTRUCTURE CONSTRUCTION **9**

Launching girders, bridge decks, off shore platforms - special forms for shells - techniques for heavy decks - Introduction to pre and Post tensioning - aerial transporting handling - erection of transmission towers.

UNIT V CONSTRUCTION EQUIPMENT **9**

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures - types of cranes - Equipment for dredging, trenching, tunneling.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Applydifferent construction techniques in structural systems.

CO2: Demonstrate the various techniques and practices on masonry construction, flooring, and roofing.

CO3: Experiment the suitable method for substructure construction.

CO4: Illustrate the methods and techniques involved in the construction of various types of Super structures.

CO5: Identify different equipment used for earthwork, foundation & piling.

TEXT BOOKS:

1. Peurifoy, R.L, Ledbetter, W.B, Schexnayder, C, "Construction Planning,Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.

2. Arora, S.P, Bindra, S.P, "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.

3. Sagar Sarangi, Amit Golder “Construction Technology & Practices”,Educreation Publishing, 2017.

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1. Jha, J, Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999. 2. Sharma, S.C. “Construction Equipment and Management”, Khanna PublishersNew Delhi, 2002.

3. Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012.

4. Mahesh, V, “Construction Equipment and its Planning and Application”,Metropolitan Book Company, New Delhi, 1983.

5. Varghese, P.C, "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

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2. https://ocw.mit.edu/courses/architecture/4-461-building-technology- i-materials-and construction-fall-2004/lecture-notes/

3. https://cbri.res.in/wp-content/uploads/2017/09/Good-Contruction-Practice-book-CBRI 2017.pdf

4. https://www.nbmcw.com/

5. https://theconstructor.org/construction/heavy-construction-equipment-types/26305

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1009	HOUSING PLANNING AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge on housing policy and sustainable housing.
- To study the roles of public, private and non-government organizations.
- To acquire knowledge on the planning, design and construction of housing projects.
- To learn the cost-effective construction techniques.
- To grasp knowledge on financing of housing projects.

UNIT I INTRODUCTION TO HOUSING 9

Definition of basic terms, Objectives and strategies of National Housing Policies including Housing classification-Perspective of housing - Principle of sustainable Housing – Integrated approach on arriving holding capacity and density norms, Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES 9

Basic concepts, Contents and standards for Housing Programmes, Co-operative Housing, Slum Housing Programmes – Housing policy - Slum improvement – Slum redevelopment and relocation – Use of GIS and MIS in Slum Housing Projects – Role of Non-Government Organizations in slum housing.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Housing planning – Human need for planning - Formulation of Housing projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations- Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing project Formulation.

UNIT IV COST-EFFECTIVE CONSTRUCTION TECHNIQUES 9

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction-Green building concept-Building Centers – Concept, Functions and Performance Evaluation – Case studies.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

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) – Unit Price for prefabricated structures – Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the basics of housing, housing laws and control regulations.
- Explain the roles of public, private and Non-Governmental organizations.
- Demonstrate the planning, design and construction of housing projects.
- Illustrate the cost-effective techniques for construction.
- Summarize the finance assistance given by the Government.

TEXTBOOKS:

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.
3. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.

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1. Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012.
2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8thEdition, Tata McGraw Hill Edition, 201.
3. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd Edition, USA2010.
4. Government of India, National Housing Policy, 1994.
5. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994.

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2. https://nptel.ac.in/courses/105/106/105106188/
3. https://nptel.ac.in/courses/124/107/124107007/
4. https://nptel.ac.in/courses/124/105/124105016/
5. https://ocw.mit.edu/courses/urban-studies-and-planning/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1
AVG	1	1

JCE1030	FORMWORK ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the overall and detailed planning of formwork.
- To impart knowledge on formwork materials, accessories, pressures and labour requirements.
- To develop the conceptual understanding of design, construction and erection of formwork.
- To impart the knowledge about different types of formwork used for special structures.
- To understand the errors in design and judge the formwork failures through case studies

UNIT I INTRODUCTION TO FORM WORK 9

Introduction to Formwork and falsework, Temporary work systems, Requirements, Construction planning and site constraints, Selection, and Classification (Types) of Formwork, General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples - Overall Planning - Detailed planning - Overall programme – Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork.

UNIT II FORMWORK MATERIALS ACCESSORIES & PRESSURES 9

Formwork Materials, Accessories and consumables – Application of tools, Reconstituted wood - Steel – Aluminum Plywood - Types and grades Standard units - Corner units – Pass units, Calculation of labour constants - Formwork hours - Labour Requirement. Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Finish - Sheathing boards working stresses - Repetitive member stress Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

UNIT III FORMWORK DESIGN 9

Concepts, Formwork Systems – components, assembly, De-shuttering, safety of work and Design for Tall Structures, Foundation Wall, Column, Slab and Beam formworks. Design of Decks and False works. Effects of various loads. Loading and moment of formwork, IS Code provisions.

UNIT IV FORMWORK FOR SPECIAL STRUCTURES 9

Formwork for Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor, Tunnel, Lift Shaft, stairs and Formwork for Precast Concrete. Various climbing systems, Table lifting systems.

UNIT V CASE STUDIES 9

Formwork failures: Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping Errors in design – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – failure formwork issues in multi - story building construction – vertical and horizontal elements used in the industry.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1 To understand the overall and detailed planning of formwork.
CO2 To impart knowledge on formwork materials, accessories, pressures and labour requirement.
CO3 To develop the conceptual understanding of design, construction and erection of formwork.
CO4 To impart the knowledge about different types of formwork used for special structures.
CO5 To understand the errors in design and judge the formwork failures through case studies.

TEXT BOOKS

1. Peurify R.L and Oberlender G.D , Formwork for Concrete Structures, , McGraw Hill Education India ,2015
2. Jha K N, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012.

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1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London and New York, 2003.
4. Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.
5. IS 14687: 1999, Falsework for Concrete Structures - Guidelines, BIS.

CO- PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	-
CO2	3	3
CO3	3	3
CO4	3	-
CO5	3	-
AVG	3	2

JCE1031	ADVANCED CONSTRUCTION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To study and understand the latest construction techniques applied to engineering construction for sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques.

UNIT I SUB STRUCTURE CONSTRUCTION 9

Construction Methodology - Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam - cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - Large reservoir construction - well points - Dewatering for underground open excavation.

UNIT II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS 9

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures.

UNIT III CONSTRUCTION OF SPECIAL STRUCTURES 9

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries

– Erection of articulated structures and space decks.

UNIT IV REHABILITATION AND STRENGTHENING TECHNIQUES 9

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

UNIT V DEMOLITION 9

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1 Understand the modern construction techniques used in the sub structure construction.

CO2 Demonstrate knowledge and understanding of the principles and concepts relevant to super structure construction for buildings

CO3 Understand the concepts used in the construction of special structures

CO4 Knowledge on Various strengthening and repair methods for different cases.

CO5 Identify the suitable demolition technique for demolishing a building.

REFERENCES:

1. Jerry Irvine, Advanced Construction Techniques, CA Rocket, 1984
2. Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
3. Peter H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.Press, 2008.
4. Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995.
5. Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University, New Delhi, 2008.

CO- PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	2	3
CO3	3	3
CO4	3	3
CO5	2	3
AVG	3	3

		L	T	P	C
JCE1032	CONSTRUCTION MANAGEMENT AND SAFETY	2	0	2	3

COURSE OBJECTIVE

- To study and understand the formulation, costing of construction projects, scheduling and various safety concepts and its requirements applied to construction projects.

UNIT I GENERAL OVERVIEW AND PROJECT ORGANIZATION 9

Introduction - Interdisciplinary nature of modern construction projects – execution of project – evaluation of bits – resource management.

UNIT II ESTIMATION OF PROJECT COST & ECONOMICS 9

Estimating quantities – description of items – estimation of project cost – running account bills – decision making in construction projects – depreciation of construction equipment – case study.

UNIT III PLANNING AND SCHEDULING 9

Introduction – project scheduling – uncertainties in duration of activities using PERT – Project monitoring and control system – resource levelling and allocation – crashing of network.

UNIT IV SAFETY DURING CONSTRUCTION 9

Basic terminology in safety - types of injuries - safety pyramid - Accident patterns - Planning for safety budget, safety culture - Introduction to OSHA regulations - Site safety programs - Job hazard analysis, accident investigation & accident indices-violation, penalty.

UNIT V SAFE OPERATING PROCEDURES 9

Safety during alteration, demolition works – Earthwork, steel construction, temporary structures, masonry & concrete construction, cutting & welding - Construction equipment, materials handling-disposal & hand tools - Other hazards – fire, confined spaces, electrical safety.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1 Perform formulations of projects.
CO2 Analyze project costing.
CO3 Identify and estimate the activity in the construction.
CO4 Develop the knowledge on accidents and their causes.
CO5 Plan, assess, analyze and manage the construction project sites.

REFERENCES:

1. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992
3. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth-Heinemann, USA , 2017.
4. Patrick X.W. Zou ,Riza YosiaSunindijo, Strategic Safety Management in Construction and Engineering John Wiley & Sons, Ltd 2015.

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	3	3
CO4	-	-
CO5	2	2
AVG	2	2

JCE1012	CONSTRUCTION PLANNING AND SCHEDULING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on estimating the activity in the construction.
- To learn the scheduling procedures.
- To study the cost flow and accounting in construction project.
- To gain knowledge on different types of safety precautions and quality control tools.
- To acquire knowledge on project information and database management.

UNIT I CONSTRUCTION PLANNING 9

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 9

Construction Schedules – Critical Path Method – Scheduling Calculations – Float – Scheduling for Activity-on-Node and with Leads, Lags, and Windows – Scheduling with Resource Constraints and Precedence‟s– Use of Advanced Scheduling Techniques – Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Trade-offs.

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 – Program Evaluation and Review Technique (PERT).

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 PROJECT 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

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Estimate the duration and resources of activity in the construction.
- Schedule the networking of activities using critical path method.
- Evaluate the budget required for construction projects.
- Recognize the various quality control tools required in the construction industry.
- Explain the different databases that can be maintained in a construction industry.

TEXT BOOKS:

1. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth-Heinemann, USA, 2017.
2. Chitkara KK, Construction project management, planning, scheduling and control,McGraw Hill (INDIA) publishers, New Delhi, third edition 2014.
3. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall,Pittsburgh, 2000.

REFERENCES:

1. Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopaedia of terms and Applications, Wiley, New York,1995.
2. Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley &Sons, New York, 1985.
3. Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986.
4. Moder.J., Phillips. C. and Davis E, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3 rd Edition, 1985.
5. Jimmi Hinze, “Construction Planning and Scheduling”,Pearson,2012.

WEBSITE REFERENCES:

1. https://www.chitkara.edu.in/
2. https://www.nitrkl.ac.in/Home.aspx
3. https://www.coursera.org/
4. https://nptel.ac.in/courses/105/104/105104161/
5. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-040-project-management-spring-2004/lecture-notes/

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1
AVG	1	1

VERTICAL 2 - SURVEYING AND GEOGRAPHIC INFORMATION SYSTEM

JCE1002 Advanced Surveying

JCE1034 Aerial Drone Surveying and Mapping

JCE1035 AI and Geo-Intelligence Using GIS

JCE1036 Application of Geospatial Technology in Cyber Security

JCE1037 Application of GIS and Remote Sensing in Machine Learning

JCE1038 Medical GIS

JCE1039 Geographical Information System in Coastal Engineering

JCE1002	ADVANCED SURVEYING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make students aware of advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
- To prepare the students to handle the errors they are likely to come across any large scale survey works.
- To know the use of Astronomy, Photo grammar, Total Station and GPS.
- To study the basic principles of GPS in civil engineering.
- To develop skills to set out Curves in the field using various surveying methods.

UNIT I TOTAL STATION SURVEYING 9

Classification – basic measuring and working principles of an Electro – optical and into wave total station- Sources of errors in Electro – optical and Microwave total station - Automatic Total Station Care and Maintenance of total station trilateration – Applications.

UNIT II GPS SURVEYING 9

Basic concepts – Space, Control and User segments – Satellite configuration – Signal structure – Orbit determination and representation – Anti spoofing and selective availability – hand held and geodetic receivers – Differential GPS - Field work procedure – Data processing Applications.

UNIT III AERIAL SURVEYING 9

Terrestrial Photogrammetry – Terrestrial stereo photogrammetry – Aerial photogrammetry - Digital Photogrammetry– overlaps – scale of photographs – Vertical and titled photographs distortion in aerial photographs – stereostopic vision - photo interpretation – Automated Photogrammetric System-Applications.

UNIT IV 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 V MISCELLANEOUS SURVEYING 9

Reconnaissance – Route 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

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Demonstrate the astronomical surveying.

CO2: Apply the photo grammar surveying and interpretation.

CO3: Solve the field problems with Totalstation.

CO4: Illustrate the GPS surveying and data processing in various applications.

CO5: Utilize the route surveys and tunnel alignments in the civil environment.

TEXT BOOKS:

1. James M. Anderson and Edward M.Mikhail, " Surveying, Theory and Practice",7thEdition, McGraw Hill, 2001.
2. Bannister and S.Raymond, "Surveying", 7th Edition, Longman 2004.
3. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.

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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. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.

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2. https://nptel.ac.in/courses/105/104/105104100/
3. https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-540-principles-of- the-global-positioning-system-spring-2012/
4. https://theconstructor.org/surveying/hydrographic-surveying-methods-uses/13838/
5. https://www.usbr.gov/tsc/techreferences/designstandards-data collection guides/design data collection guides-pdfs docs/chapter4/chap4_sec4.pdf

CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	3	1	1	-	1	1	1	1	2	1	2
CO2	3	3	1	1	-	1	1	1	1	2	1	2
CO3	3	3	1	1	-	1	1	1	1	2	1	2
CO4	3	3	1	1	-	1	1	1	1	2	1	2
CO5	3	3	1	1	-	1	1	1	1	2	1	2
AVG	3	3	1	1	-	1	1	1	1	2	1	2

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1034	AERIAL DRONE SURVEYING AND MAPPING	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the basic concepts and principles of aerial drone surveying and mapping.
- Learn the fundamentals of drone technology, including types of drones, components, and flight operations.
- Develop skills in data collection using aerial drones, including flight planning, sensor integration, and image capture.
- Familiarize students with popular mapping software tools and their functionalities.
- Apply acquired knowledge and skills in real-world scenarios through practical exercises

UNIT I INTRODUCTION TO AERIAL DRONE SURVEYING AND MAPPING 9

Overview of aerial drone technology and its applications - Introduction to surveying and mapping concepts - Different types of drones and their characteristics - Regulations and legal considerations for drone operation - Safety precautions and risk management in drone operations.

UNIT II DRONE FLIGHT PLANNING AND OPERATIONS 9

Principles of flight planning for drone missions - Selection and setup of appropriate drones and sensors - Pre-flight checks and safety procedures - Basic piloting skills and flight manoeuvres- capturing aerial imagery and data using drones.

UNIT III DATA PROCESSING AND PHOTOGRAMMETRY 9

Introduction to photogrammetry and its role in drone mapping - Processing aerial imagery using photogrammetry software - Creation of digital surface models (DSMs) and digital elevation models (DEMs)- Orthorectification and mosaicking of aerial images - Quality control and accuracy assessment of drone-derived data.

UNIT IV MAPPING APPLICATIONS AND ANALYSIS 9

Introduction to Geographic Information Systems (GIS) - Integration of drone data into GIS platforms - Mapping various terrains and environments using drone - derived data - Data visualization and interpretation techniques - Introduction to 3D modelling and terrain analysis.

UNIT V APPLICATIONS OF DRONE SURVEYING 9

Case Studies - Archaeological Mapping - Infrastructure Development - Environmental Conservation - Disaster Management - Precision Agriculture - Urban Planning

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Demonstrate a solid understanding of the basic concepts and principles of aerial drone surveying and mapping.
- Identify different types of drones, their components, and the principles of flight operations.
- Apply surveying techniques using drones, including photogrammetry and LiDAR, for data collection and mapping purposes.
- Plan and execute drone flights for data collection, integrating sensors and capturing images effectively.
- Process and analyse collected drone data using mapping software tools to generate accurate maps and visualizations.

TEXT BOOKS

- Lillesand and Kiefer, "Remote Sensing and Image Interpretation", 5th Edition, published by John Wiley and Sons, 2008.
- One Nation Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems by John E. Jackson.
- A.M. Chandra, S.K. Ghosh, "Remote Sensing and Geographical Information System", Narosa Publishing house, 1st Edition, 2007.

REFERENCES:

- McGlone, J. C. (2018). Introduction to UAV Systems. CRC Press.
- Westoby, M. J., et al. (2012). Structure-from-Motion' photogrammetry: A low-cost, effective tool for geoscience applications. Geomorphology, 179, 300-314.
- Esri. (2021). Getting to Know ArcGIS. Esri Press.
- Drones and Support for the Use of Force by James Igoe Walsh.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	1	2
CO2	1	3
CO3	2	3
CO4	2	2
CO5	1	3
AVG	2	2

JCE1035	AI AND GEO- INTELLIGENCE USING GIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the AI-GIS integration concepts.
- To study the collecting techniques and pre-processing for Geo-intelligence
- To study the Machine learning algorithms for geospatial analysis
- To study the latest emerging trends in AI techniques.
- To know the applications of AI and GIS.

UNIT I INTRODUCTION TO GEO-INTELLIGENCE AND AI-GIS INTEGRATION 9

Overview of Artificial Intelligence and its applications - Introduction to Geographic Information Systems (GIS) - Integration of AI and GIS: Concepts and significance - Case studies highlighting the use of AI and GIS in real-world scenarios - Key challenges and opportunities in applying AI techniques to geospatial data.

UNIT II GEOSPATIAL DATA ACQUISITION AND PRE-PROCESSING FOR GEO-INTELLIGENCE 9

Geospatial data sources and collection techniques - Pre-processing geospatial data for analysis - Data integration and fusion in AI-GIS applications - Quality assessment and assurance of geospatial data.

UNIT III AI TECHNIQUES FOR GEOSPATIAL ANALYSIS IN GEO- INTELLIGENCE 9

Overview of AI techniques applicable to Geo-Intelligence - Machine learning algorithms for geospatial analysis - Deep learning for feature extraction and pattern recognition - Ensemble methods and hybrid models for Geo-Intelligence applications.

UNIT IV EMERGING TRENDS AND FUTURE DIRECTIONS 9

Advances in AI techniques for Geo-Intelligence - Integration of AI with emerging technologies (e.g., IoT, big data) - Emerging applications and potential impact of AI-GIS in Geo-Intelligence.

UNIT V APPLICATIONS OF AI AND GIS IN GEO- INTELLIGENCE 9

AI-based geospatial analysis for urban planning and management - Environmental monitoring and risk assessment using AI and GIS - Geospatial intelligence for defense and security applications - AI-driven decision support systems for spatial planning.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Understand the concept of AI and integrated GIS.
- Understand the collecting techniques and pre-processing for Geo-intelligence
- Study the Machine learning algorithms for geospatial analysis
- Study the latest emerging trends in AI techniques.
- Apply the AI and GIS technologies in various fields

TEXT BOOKS

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
2. "Geographic Information Science and Systems" by Paul A. Longley, Michael F. Goodchild, David J. Maguire, and David W. Rhind
3. "AI for Geospatial Analysis" by Yuqi Bai and Shaowen Wang
4. "Geospatial Analysis: A Comprehensive Guide" by Michael J. de Smith, Michael F. Goodchild, and Paul A. Long.

REFERENCES:

1. Geospatial Intelligence: Origins and Evolution" by Claudio S. Silva, Christopher J. Silva, and Ryan R. Scott
2. "Geographic Information Science and Systems" by Paul A. Longley, Michael F. Goodchild, David J. Maguire, and David W. Rhind
3. "GIS for Urban and Regional Planning" by Richard P. Greene and David A. DiBiase
4. "Geospatial Technologies in Environmental Management" by Jayant Sharma and Robert K. Vincent
5. "Geospatial Intelligence for Public Safety and Security" by Paul Zandbergen
6. "GIS and the Law: The Rule of Space and the Rule of Law" by George Cho

CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO 11	PO1 2
CO1	3	3	3	3	2	1	1	1	3	2	2	3
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CO3	3	3	3	3	2	1	1	1	3	2	2	3
CO4	3	3	3	3	2	1	1	1	3	2	2	3
CO5	3	3	3	3	2	1	1	1	3	2	2	3
AVG	3	3	3	3	2	1	1	1	3	2	2	3

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1036	APPLICATION OF GEOSPATIAL TECHNOLOGY IN CYBER SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the AI-GIS integration concepts.
- To study the collecting techniques and pre-processing for Geo-intelligence
- To study the Machine learning algorithms for geospatial analysis
- To study the latest emerging trends in AI techniques.
- To know the applications of AI and GIS.

UNIT I BASIC INTRODUCTION TO GIS AND CYBERSECURITY 9

Overview of Geographic Information Systems (GIS) - Introduction to Cybersecurity and its importance - Intersection of GIS and Cybersecurity - Key concepts and principles of geospatial technology in cybersecurity - Ethical and legal considerations in geospatial cybersecurity.

UNIT II GEOSPATIAL DATA COLLECTION AND ANALYSIS FOR CYBERSECURITY 9

Geospatial data sources for cybersecurity - Geospatial data collection techniques and tools - Geospatial data analysis methods for detecting cyber threats - Spatial data visualization for cybersecurity analysis - Case studies on the use of geospatial data in cybersecurity incident response.

UNIT III GEOSPATIAL TECHNIQUES FOR NETWORK SECURITY 9

Geolocation-based IP address tracking-Mapping network infrastructure for vulnerability assessment - Spatial analysis for identifying network anomalies and intrusions - Geospatial mapping of cyberattack origins - Use of GIS for network security monitoring and response.

UNIT IV GEOSPATIAL INTELLIGENCE FOR CYBER THREAT DETECTION 9

Geospatial intelligence techniques for detecting cyber threats - Spatial-temporal analysis for identifying patterns and correlations - Location-based anomaly detection in cyber security data - Geospatial visualization for cyber threat monitoring - Case studies on geospatial intelligence in cybersecurity operations.

UNIT V GEOSPATIAL BASED CYBER SECURITY SOLUTIONS 9

Geospatial technologies for secure infrastructure planning and design, Geographic information systems for risk assessment and management, Application of geospatial analytics in incident response and recovery, Geospatial data fusion for comprehensive cybersecurity situational awareness, Future trends and emerging applications of geospatial technology in cybersecurity

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Understand the fundamentals of geospatial technology and its role in cybersecurity.
- Recognize the potential applications of geospatial technology in identifying and mitigating cyber threats.
- Analyze and interpret geospatial data to identify patterns and anomalies related to cybersecurity incidents.
- Apply geospatial analysis techniques for mapping and visualizing cyber threats and vulnerabilities.
- Design and develop geospatial-based cybersecurity solutions to enhance the security posture of organizations

TEXT BOOKS

1. "GIS Fundamentals: A First Text on Geographic Information Systems" by Paul Bolstad
2. "Geographic Information Science and Systems" by Paul A. Longley, Michael F. Goodchild, David J. Maguire, and David W. Rhind
3. "Geospatial Intelligence: Origins and Evolution" by Claudio S. Silva, Christopher J. Silva, and Ryan R. Scott
4. "Geospatial Techniques in Urban Hazard and Disaster Analysis" by Pamela S. Showalter and Douglas R. Greenfield
5. "Cybersecurity: Protecting Critical Infrastructures from Cyber Attack and Cyber Warfare" by Thomas A. Johnson.

REFERENCES:

1. "Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS" by Tyson Macaulay and Bryan L. Singer
2. "Geospatial Analysis: A Comprehensive Guide" by Michael J. de Smith, Michael F. Goodchild, and Paul A. Longley
3. "Cybersecurity: The Essential Body of Knowledge" edited by Dan Shoemaker, Wm. Arthur Conklin, and David K. White

WEB REFERENCES

1. Geospatial World (https://www.geospatialworld.net/): Provides news, articles, and resources related to geospatial technology and its applications.

2. GIS Lounge (https://www.gislounge.com/): Offers tutorials, articles, and industry news on GIS and geospatial technology.
3. Cybersecurity and Infrastructure Security Agency (CISA) (https://www.cisa.gov/): Provides resources, guidelines, and alerts related to cybersecurity.
4. National Geospatial-Intelligence Agency (NGA) (https://www.nga.mil/): Offers geospatial intelligence resources, publications, and tools.
5. EsriCybersecuritySolutions (https://www.esri.com/en-us/industries/cybersecurity/overview):Provides information and solutions related to using GIS in cybersecurity

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
AVG	3	3

JCE1037	APPLICATION OF GIS & REMOTE SENSING IN MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand machine learning in GIS & remote sensing.
- To understand data pre-processing technique for GIS
- To understand Linear regression and logistic regression
- To study unsupervised learning & clustering in spatial analysis.
- To study the application of machine learning and GIS.

UNIT I INTRODUCTION TO MACHINE LEARNING IN GIS & REMOTE SENSING 9

Overview of machine learning and its applications in GIS and Remote Sensing - Introduction to supervised, unsupervised, and semi-supervised learning - Key concepts in machine learning - including training, validation, and testing - Evaluation metrics for assessing machine learning models in geospatial analysis.

UNIT II PRE- PROCESSING AND FEATURE EXTRACTION IN GEOSPATIAL DATA 9

Data pre-processing techniques for GIS and Remote Sensing data - Handling missing values - outlier detection, and data normalization - Feature extraction and selection methods for geospatial data - Dimensionality reduction techniques and their applications.

UNIT III SUPERVISED LEARNING ALGORITHMS IN GIS & REMOTE SENSING 9

Linear regression and logistic regression for spatial prediction - Decision trees and random forests for classification and regression tasks - Support vector machines (SVM) for geospatial analysis - Neural networks and deep learning models for GIS and Remote Sensing.

UNIT IV UNSUPERVISED LEARNING AND CLUSTERING TECHNIQUES 9

K-means clustering and hierarchical clustering in spatial analysis - Density-based clustering algorithms (DBSCAN) - Self-organizing maps (SOM) for geospatial data exploration - Evaluation and interpretation of clustering results in GIS.

UNIT V APPLICATIONS OF MACHINE LEARNING IN GIS & REMOTE SENSING 9

Land cover classification and land use prediction using machine learning - Object detection and image segmentation in Remote Sensing imagery - Change detection and time-series analysis using machine learning techniques - Geospatial data fusion and integration for improved

predictions - Case studies and real-world applications of machine learning in GIS & Remote Sensing.

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Understand the fundamental concepts of machine learning in the context of GIS and Remote Sensing, and recognize its potential and applications in various geospatial domains.
- Employ supervised learning algorithms and to Utilize unsupervised learning and clustering techniques.
- Apply pre-processing techniques to prepare GIS and Remote Sensing data for machine learning analysis.
- Apply machine learning algorithms for practical applications in GIS and Remote Sensing,

TEXT BOOKS

1. Goodchild, M. F., Janelle, D. G., & Benenson, I. (Eds.). (2012). Geographic Information Science and Systems. Wiley

REFERENCES:

1. Jensen, J. R. (Ed.). (2016). Remote Sensing of the Environment: An Earth Resource Perspective. Pearson.
2. Hastie, T., Tibshirani, R., & Friedman, J. (2009). The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Springer.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	2	2
CO3	2	3
CO4	1	3
CO5	1	2
AVG	2	2

JCE1038	MEDICAL GIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concept of GIS
- To study the spatial database creation for health related data
- To create the disease mapping and collect the data sources related to that
- To study the Medical data visualization and mapping techniques and Web-based GIS platforms and applications.
- To understand the practical applications related to GIS

UNIT I BASIC INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (GIS) 9

Overview of GIS - Components and functionality of GIS - Basic concepts and principles of spatial data - Coordinate systems and map projections - Introduction to GIS software and tools - Open Source and Proprietary software.

UNIT II SPATIAL DATABASE CREATION AND USAGE 9

Data collection methods for health-related data - Spatial data types and formats - Georeferencing and data integration - Attribute data management and database design - Spatial analysis techniques and tools.

UNIT III DISEASE MAPPING HISTORY AND CURRENT SCENARIO 9

Historical perspective of disease mapping - Significance of disease mapping in public health - Disease surveillance systems and data sources - Spatial epidemiology and disease patterns - Mapping disease outbreaks and hotspots - Infectious Disease Tracking using GIS.

UNIT IV WEB GIS & TELEMEDICINE 9

Role of GIS in medical applications - Medical data visualization and mapping techniques - Web-based GIS platforms and applications - Online health data sources and resources - Case studies and examples of medical-related web GIS applications - Role of ICT in Telemedicine – Evaluation – types - Recent Technologies and its impact on Telemedicine.

UNIT V PRACTICAL APPLICATIONS AND PROJECT 9

Hands-on exercises and practical applications of GIS in health - Group project involving the use of GIS for health-related analysis - Data collection, processing - and visualization for a specific health issue - Presentation and discussion of project outcomes - Review and assessment of GIS skills and knowledge acquired.

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Understand the basic concept of GIS
- Study the Spatial analysis techniques and tools.
- Understand the Disease surveillance systems and data sources
- Study the Online health data sources and resources and Understand the Role of ICT in Telemedicine.
- Study the practical application on Data collection, processing.

TEXT BOOKS

1. Geospatial Data Science in Healthcare for Society, 5.0, ISBN.978-981-16-9475-2Springer, Role of ICT in Telemedicine, Infectious Disease and Their Tracking in GIS and by M. Ramalingam, J.Jayachandran.
2. "GIS Fundamentals: A First Text on Geographic Information Systems" by Paul Bolstad
3. "Introduction to Geographic Information Systems" by Kang-Tsung Chang.

REFERENCES:

1. GIS and Public Health, 2nd Edition,ISBN-10.1609187504by Ellen K. Cromley (Author), Sara L. McLafferty
2. "Web GIS: Principles and Applications" by Pinde Fu and Jiulin Sun
3. "Geographic Information Systems for Healthcare" by Antony Cooper
4. "Telemedicine: Medicine and Communication" by Ronald C. Merrell and Ira J. Kaufman
5. "GIS Research Methods: Incorporating Spatial Perspectives" by Sheila Lakshmi Steinberg and Michael F. Goodchild

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	3
AVG	2	2

JCE1039	GEOGRAPHICAL INFORMATION SYSTEM IN COASTAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamental concepts and principles of GIS and its application in health and human services.
- To gain proficiency in using GIS software to analyze and interpret geospatial data.
- To develop skills in data acquisition, data preparation, and data management for health and human services applications.
- To apply GIS techniques to identify spatial patterns, trends, and disparities in health and human services data.
- To utilize GIS to support decision-making processes related to resource allocation, program planning, and service delivery in health and human services

UNIT I INTRODUCTION TO GIS IN HEALTH AND HUMAN SERVICES 9

Overview of GIS concepts and principles - Introduction to health and human services applications of GIS - Role of GIS in public health - healthcare planning - and social services.

UNIT II DATA ACQUISITION AND MANAGEMENT 9

Data sources and types relevant to health and human services - Techniques for acquiring - organizing, and managing geospatial data - Spatial data quality and data standards.

UNIT III SPATIAL ANALYSIS IN HEALTH AND HUMAN SERVICES 9

Spatial statistics and analysis techniques - Identifying spatial patterns and clusters - Geocoding and address matching for health and social data.

UNIT IV SPATIAL EPIDEMIOLOGY AND DISEASE MAPPING 9

Introduction to spatial epidemiology - Disease mapping and visualization - Spatial interpolation techniques.

UNIT V RESOURCE ALLOCATION AND PROGRAM PLANNING 9

Spatial decision-making in health and human services - Geospatial analysis for resource allocation - GIS applications in program planning and evaluation - Data sources and types relevant to health and human services - Techniques for acquiring - organizing, and managing geospatial data - Spatial data quality and data standards.

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Understand the fundamental concepts and principles of GIS and its application in health and human services.
- Gain proficiency in using GIS software to analyze and interpret geospatial data.
- Develop skills in data acquisition, data preparation, and data management for health and human services applications
- Apply GIS techniques to identify spatial patterns, trends, and disparities in health and human services data.
- Utilize GIS to support decision-making processes related to resource allocation, program planning, and service delivery in health and human services

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TEXT BOOKS

1. "GIS Tutorial for Health" by Kristen S. Kurland and Wilpen L. Gorr
2. "GIS for Public Health" by Ellen K. Cromley and Sara L. McLafferty
3. "GIS and Health: GIS for Public Health" by Laura E. B. Nabarro, Timothy G. B. Clarkson, and Paul A. Longley

REFERENCES:

1. GIS for Environmental Decision-Making" by Andrew C. Millington, Mark W. T. Blumler, and Udo Schickhoff
2. "GIS in Hospital and Healthcare Emergency Management" by Ric Skinner
3. "GIS Data Sources, 2nd Edition" by Drew Decker
4. "GIS and Public Health" by Ellen K. Cromley and Sara L. McLafferty

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	2	2
CO3	2	2
CO4	3	3
CO5	2	3
AVG	3	3

JCE1040	AIRBORNE AND TERRESTRIAL LASER MAPPING	L	T	P	C
		3	0	0	3

OBJECTIVE: To introduce the concepts of Space Borne, Air Borne, Terrestrial and Bathymetric LASER Scanners for Topographic and Bathymetric Mapping

UNIT I SPACE BORNE RADAR AND LIDAR ALTIMETER 9

Principle and Properties of LASER- Production of Laser – Components of LASER – LiDAR – Types of LiDAR :Range Finder, DIAL and Doppler LiDAR - Platforms: Terrestrial, Airborne and Space borne LiDAR – Space Borne LiDAR Missions – Space Borne Radar Altimeter for mapping Sea Surface Topography , Moon Topography - Merits of ALS in comparison to Levelling, echo sounding, GPS leveling, Photogrammetry and Interferometry

UNIT II AIRBORNE LASER SCANNERS 9

Airborne Topographic Laser Scanner – Ranging Principle – Pulse Laser and Continuous Wave Laser – First Return and Last Return – Ellipsoidal and Geoidal Height - Typical parameters of a Airborne Laser Scanner (ALS) – Specifications of Commercial ALS –- Components of ALS - GPS, IMU, LASER Scanner, Imaging Device, Hardware and Software.

UNIT III DATA ACQUISITION AND PREPROCESSING 9

Various Scanning Mechanism – Synchronization of GPS, IMU and ALS Data - Reflectivity of terrain objects – Laser Classification – Class I to Class IV Laser – Eye Safety - Flight Planning – Determination of various data acquisition parameters – Swath Width, Point Density, No. of Strips, Area Covered, Point Spacing - Data Processing – Determination of flight trajectory

UNIT IV POST PROCESSING AND APPLICATIONS 9

Post Processing – Geo location of Laser Foot Prints – Various Co-ordinate Transformations involved - Filtering - Ground Point filtering – Digital Surface Model and Digital Elevation Model - LIDAR data formats – Post Processing Software - Overview of LIDAR Applications in various domains - 3D city models – Corridor Mapping Applications – Forestry Applications.

UNIT V TERRESTRIAL AND BATHYMETRIC LASER SCANNERS 9

Terrestrial Laser Scanners (TLS) – Working Principle – Commercial TLS Specifications – Bathymetric Laser Scanners (BLS) – Working Principle of BLS – Depth of Penetration of BLS – Applications of TLS and BLS

TOTAL : 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand Concepts of ALTM and working principle Available types of ATLM sensors and components of ALTM system Process of data acquisition, data processing and possible applications The fundamentals of terrestrial and bathymetric scanners and their applications

TEXTBOOKS:

1. Jie Shan and Charles K. Toth, Topographic Laser Ranging and Scanning – Principles and Processing, CRC Press, Taylor & Francis Group, 2009

2. George Vosselman and Hans-Gerd Maas, Airborne and Terrestrial Laser Scanning, Whittles Publishing, 2010.

3. Michael Renslow, Manual of Airborne Topographic LiDAR, The American Society for Photogrammetry and Remote Sensing , 2013.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	2	2
CO3	2	3
CO4	1	3
CO5	1	2
AVG	2	2

VERTICAL 3 -GEOTECHNICAL ENGINEERING

JCE1006 Engineering Geology

JCE1026 Introduction to Soil Dynamics and Machine Learning

JCE1027 Geo Environmental Engineering

JCE1041 Remote Sensing

JCE1042 Earth and Earth Retaining Structures

JCE1043 Pile Foundation

JCE1044 Tunneling Engineering

JCE1045 Rock Mechanics

JCE1006	ENGINEERING GEOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the importance of geological knowledge such as earth, earth quake, volcanism.
- To introduce the properties of minerals.
- To learn about design, performance of various particulate contaminants.
- To impart knowledge the methods of study on geological structure.
- To gain knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor.

UNIT I PHYSICAL GEOLOGY 9

Geology in civil engineering – branches of geology – structure of earth and its composition, weathering of rocks – scale of weathering – soils - landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering. Plate tectonics –Earthquakes – Seismic zones in India.

UNIT II MINERALOGY 9

Physical properties of minerals - Quartz group, Feldspar group, Pyroxene – hypers thene and augite, Amphibole - hornblende, Mica - muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III PETROLOGY 9

Formation and classification of rocks - Igneous, Sedimentary and metamorphic rocks, their texture and structures - properties of granite - pegmatite, dolerite, gabbro, charnockite, basalt, sandstone, conglomerate, breccia, limestone, shale, laterite, schist, gneiss, quartzite, marble, khonda lite and slate. Drilling Techniques - Core Recovery – RQD - Engineering Properties of Rocks.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS 9

Geological maps - attitude of beds, study of structures - folds, faults and joints – relevance to civil engineering. Geophysical methods - Seismic and electrical methods for sub surface investigations.

UNIT V APPLICATION OF GEOLOGICAL INVESTIGATIONS 9

Remote sensing for Civil Engineering applications - Geological conditions necessary for design and construction of Dams - Reservoirs, Tunnels, and Road cuttings – Hydrogeological investigations and mining - Coastal protection structures - Investigation of Landslides, causes and mitigation.

TOTAL:45 PERIODS

TEXTBOOKS:

1. Varghese, P.C, “Engineering Geology for Civil Engineering”, Prentice Hall of India Learning Private Limited, New Delhi, 2012.
2. Venkat Reddy, D. “Engineering Geology”, Vikas Publishing House Pvt. Lt, 2010.
3. Gokhale, K.V.G.K, "Principles of Engineering Geology", B.S. Publications, Hyderabad2011.

REFERENCES:

1. Chenna, K. N, "Textbook of Engineering Geology", Macmillan India Ltd., 2009.
2. Parbin Singh. A, "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.
3. Blyth, F.G.H, Freitas M.H, “Geology for Engineers”, Edward Arnold, London, 2010.
4. Bell, F.G, "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
5. Dobrin, M.B, "An introduction to geophysical prospecting", McGraw Hill, New Delhi,1988.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/105/105105106/
2. https://mines.gov.in/writereaddata/UploadFile/Ebookonmineralsector635911539399 033616.pdf
3. https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-001-introduction- to-geology-fall-2013/
4. https://geology.com/
5. https://nptel.ac.in/courses/105/105/105105170/

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1026	INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To have the basic knowledge about the theory of vibration.
- To understand the different types of waves and its behaviour.
- To have enough knowledge about various laboratory and field tests to determine the dynamic soil properties and its interpretation.
- To Assess the contamination in the soil and to select suitable remediation methods based on contamination.
- To Assess the influence of vibrations and selection of remediation methods based on the nature of vibration, properties and behaviour of soil.

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 weightless 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 REMEDIATION 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: 60 PERIODS

TEXT BOOKS:

1. Swamisaran, "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 McGraw-Hill, 2007

REFERENCES:

1. Kamaswara Rao., "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi,
2. Kameswara Rao., "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003.
3. Moore, P.J., "Analysis and Design of Foundation for Vibration", Oxford and IBH, 2005.
4. Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall, 2014.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	3
AVG	2	2

JCE1027	GEO-ENVIRONMENTAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To assess broad knowledge on Sources, production and classification of waste
- To provide adequate knowledge about Characterization of land fill sites and waste
- To provide adequate knowledge about Contaminant transformation and safe disposal of waste.
- To acquire knowledge on presenting a broad background of waste stabilisation
- To identify knowledge on soil contamination different techniques thereby protecting environment.

UNIT I GENERATION OF WASTES AND CONSQUENCES OF SOIL POLLUTION 8

Introduction to Geo environmental engineering – Environmental cycle – Phases of waste-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 – Causes and remedy for contaminants -Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution

UNIT IV WASTE STABILIZATION 10

Stabilization - Phases of landfill 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-Methods-Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, verification, bio-venting

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Assess the contamination in the soil
- Understand the current practice of waste disposal
- To prepare the suitable disposal system for particular waste.
- Stabilize the waste and utilization of solid waste for soil improvement.
- Select suitable remediation methods based on contamination.

TEXTBOOKS:

1. Hari D. Sharma and Krishna R. Reddy, "Geo-Environmental Engineering" –John Wiley and Sons, INC, USA, 2014.
2. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman & Hall, London 2013.
3. Manoj Datta," Waste Disposal in Engineered landfills", Narosa Publishing House, 2012.
4. Manoj Datta, B.P. Parida, B.K. Guha, "Industrial Solid Waste Management and Landfilling Practice", Narosa Publishing House, 2019.

REFERENCES:

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 2012.
2. Wentz, C.A., "Hazardous Waste Management", McGraw Hill, Singapore, 2012
3. Proceedings of the International symposium on "Environmental Geotechnology" (Vol.I and II). Environmental Publishing Company.
4. Fried, J.J., "Ground Water Pollution", Elsevier.
5. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 2015.
6. Lagrega, M.D., Buckinham, P.L. and Evans, J.C., "Hazardous Waste Management" McGraw Hill Inc. Singapore, 2014.

Mapping of PO with CO

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

Mapping of PSO with CO

CO\PSO	PSO1	PSO2
CO1	2	2
CO2	-	-
CO3	-	-
CO4	-	-
CO5	2	2
AVG	1	1

JCE1041	REMOTE SENSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students to understand the concepts, components and source of remote sensing
- To gain knowledge about different types of remote sensing platforms and sensors
- To explain the concept of satellite image interpretation
- To understand the applications of remote sensing in Civil Engineering

UNIT I REMOTE SENSING AND ELECTROMAGNETIC RADIATION 9

Definition – components of RS – History of Remote Sensing – Merits and demerits of data collation between conventional and remote sensing methods - Electromagnetic Spectrum – Radiation principles - Wave theory, Planck‘s law, Wien’s Displacement Law, Stefan’s Boltzmann law, Kirchoff‘s law – Radiation sources: active & passive - Radiation Quantities

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL 9

Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere – Scattering, absorption and refraction – Atmospheric windows - Energy balance equation – Specular and diffuse reflectors – Spectral reflectance & emittance – Spectroradiometer – Spectral Signature concepts – Typical spectral reflectance curves for vegetation, soil and water – solid surface scattering in microwave region.

UNIT III ORBITS AND PLATFORMS 9

Motions of planets and satellites – Newton‘s law of gravitation - Gravitational field and potential - Escape velocity - Kepler‘s law of planetary motion - Orbit elements and types – Orbital perturbations and maneuvers – Types of remote sensing platforms - Ground based, Airborne platforms and Space borne platforms – Classification of satellites – Sun synchronous and Geosynchronous satellites – Legrange Orbit.

UNIT IV SENSING TECHNIQUES 9

Classification of remote sensors – Resolution concept : spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners – Optical-infrared sensors – Thermal sensors – microwave sensors – Calibration of sensors - High Resolution Sensors - LIDAR , UAV –Orbital and sensor characteristics of live Indian earth observation satellites

UNIT V DATA INTERPRETATION AND CIVIL ENGINEERING APPLICATIONS 9

Photographic and digital products – Types, levels and open source satellite data products –- selection and procurement of data– Visual interpretation: basic elements and interpretation keys– Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification – Civil Engineering applications: highway and railway alignments, site selection for dams, town and regional planning

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Thomas M.Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York, 2009.

2. George Joseph and C Jeganathan, Fundamentals of Remote Sensing, Universities Press (India) Private limited, Hyderabad, 2018

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1. Janza, F.Z., Blue H.M. and Johnson,J.E. Manual of Remote Sensing. Vol.I, American Society of Photogrametry, Virginia, USA, 2002.
2. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995
3. Paul Curran P.J. Principles of Remote Sensing. Longman, RLBS, 2003.
4. Introduction to Physics and Techniques of Remote Sensing , Charles Elachi and Jacob Van Zyl, 2006 Edition II, Wiley Publication.
5. Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 2011

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	2	2
CO2	-	-
CO3	-	-
CO4	-	-
CO5	2	2
AVG	1	1

JCE1042	EARTH AND EARTH RETAINING	L	T	P	C

	STRUCTURES	3	0	0	3

COURSE OBJECTIVES:

- To Analyze the earth pressure acting on retaining structures
- To Design rigid retaining structures
- To Design flexible earth retaining walls
- To analyze and design braced excavations, slurry supported excavations and underground utilities
- To perform stability analysis by considering the actual shape of slurry support

UNIT I EARTH PRESSURE THEORIES **9**

Introduction – State of stress in retained soil mass – Earth pressure theories – Classical and graphical techniques (Culmann's method) – Active and passive cases – Earth pressure due to external loads.

UNIT II COMPACTION, DRAINAGE AND STABILITY OF RETAINING STRUCTURES 9

Retaining structure – Selection of soil parameters - Lateral pressure due to compaction, strain softening, wall flexibility, drainage arrangements and its influence. – Stability analysis of retaining structure both for regular and earthquake forces.

UNIT III SHEET PILE WALLS **9**

Types of sheet piles - Analysis and design of cantilever and anchored sheet pile walls – free earth support method – fixed earth support method. Design of anchor systems - isolated and continuous.

UNIT IV SUPPORTED EXCAVATIONS **9**

Lateral pressure on sheeting in braced excavation - stability against piping and bottom heaving. Earth pressure around tunnel lining, shaft and silos – Soil anchors – Soil pinning –Basic design concepts.

UNIT V SLURRY SUPPORTED EXCAVATION **9**

Slurry supported trenches-basic principles-slurry characteristics-specifications-diaphragm walls-bored pile walls-contiguous pile wall-secant piles-stability analysis.

TOTAL: 45 PERIODS

REFERENCES:

1. Clayton, C.R.I., Militisky, J. and Woods, R.I., Earth pressure and Earth- Retaining structures,

Second Edition, Survey University Press, 1993
2. Das, B.M., Principles of Geotechnical Engineering, Fourth Edition, The PWS series in Civil Engineering, 1998.
3. Militisky, J. and Woods, R., Earth and Earth retaining structures, Routledge,1992.
4. Winterkorn, H.F. and Fang, H.Y., Foundation Engineering Handbook, GalgotiaBooksource, 2000.
5. Rowe, R.K., Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, 2001.
6. Koerner, R.M. Designing with Geosynthetics, Third Edition, Prentice Hall, 1997.
7. Day, R.W., Geotechnical and Foundation Engineering: Design and Construction, McGraw Hill, 1999.
8. Mandal, J.N., Reinforced Soil and Geotextiles, Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi, 1993.
9. McCarthy, D.F., Essentials of Soil Mechanics and Foundations: Basic Geotechnics, Sixth Edition, Prentice Hall, 2002.
10. Hajnal, I., Marton, J. and Regele, Z., Construction of diaphragm walls, A Wiley – Interscience Publication, 1984.
11. Petros P. Xanthakos., Slurry walls as structural systems, McGraw-Hill, Inc., New York, 1994.
12. Bramhead, E.N., The Stability of Slopes, Blacky Academic and Professionals Publications, Glasgow, 1986.
13. Muni Budhu, Soil Mechanics and Foundation, John Wiley and Sons, INC 2007.

CO-PO MAPPINGS

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	3	3	3	3	3
CO2	2	2	3	3	3	2	1	1	2	1	3	3
CO3	2	2	3	3	3	2	1	1	2	2	3	3
CO4	3	3	3	1	3	3	1	1	1	2	3	3
CO5	3	1	2	2	3	2	2	3	1	-	3	3
AVG	3	3	3	3	3	3	2	2	2	2	3	3

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	2	2
CO3	2	2
CO4	3	3
CO5	2	3
AVG	3	3

JCE1043	PILE FOUNDATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Explain the importance of pile foundation and various functions
- Determine the vertical load carrying capacity of pile and pile group
- Pile subjected to lateral and uplift load with reference to codal provision
- Understand the design of pile and pile caps
- To check the stability of caissons based on codal provisions

UNIT I PILE CLASSIFICATIONS AND LOAD TRANSFER PRINCIPLE 9

Necessity of pile foundation – classification of piles – Factors governing choice of type of pile – Load transfer mechanism – piling equipments and methods – effect of pile installation on soil condition – pile raft system – basic interactive analysis - criteria for pile socketing.

UNIT II AXIAL LOAD CAPACITY OF PILES AND PILE GROUPS 9

Allowable load of piles and pile groups – Static and dynamic methods – for cohesive and cohesionless soil – negative skin friction – group efficiency – pile driving formulae - limitation – Wave equation application – evaluation of axial load capacity from field test results - Settlement of piles and pile group.

UNIT III LATERAL AND UPLIFT LOAD CAPACITIES OF PILES 9

Piles under Lateral loads – Broms method, elastic, p-y curve analyses – Batter piles – response to moment – piles under uplift loads – under reamed piles – Drilled shaft – Lateral and pull out capacity from load test.

UNIT IV STRUCTURAL DESIGN OF PILE AND PILE GROUPS 9

Structural design of pile – structural capacity – pile and pile cap connection – pile cap design – shape, depth, assessment and amount of steel – truss and bending theory- Reinforcement details of pile and pile caps — pile subjected to vibration.

UNIT V CAISSONS 9

Necessity of caisson – type and shape - Stability of caissons – principles of analysis and design – tilting of caisson – construction - seismic influences.

TOTAL: 45 PERIODS

REFERENCES:

1. Das, B.M., Principles of Foundation Engineering, Design and Construction, Fourth Edition, PWS Publishing, 1999.
2. Poulos, H.G., Davis, E.H., Pile foundation analysis and design, John Wiley and Sons, New York, 1980.
3. Tomlinson, M.J. Foundation engineering, ELBS, Longman Group, U.K. Ltd., England 1995.
4. Michael Tomlinson and John Woodward, Pile design and construction practice, Taylor & Francis Group, London & New York, 2008.
5. Cernica, J.N. Geotechnical Engineering Foundation Design, John Wiley and Sons, Inc. 1995.
6. Bowles, J.E., Foundation Analysis and Design, Fifth Edition, McGraw Hill, New York, 1996.
7. Donald, P., Coduto, Foundation Design Principles and Practices, Prentice Hall, Inc. Englewood Cliffs, New Jersey, 1996.
8. Varghese P.C.," Foundation Engineering", PHI Learning Private Limited, New Delhi, 2005.
9. Reese,L.C., Isenhower,W.M. and Wang,S.T. Analysis and Design of Shallow and Deep Foundations, John Wiley and Sons, New York, 2005.
10. Varghese P.C.," Design of Reinforced Concrete Foundations", PHI Learning Private Limited, New Delhi, 2009.
11. Reese, L. C. and Van Impe, W. F., Single Piles and Pile Groups Under Lateral Loading, Taylor and Francis, London, 2011.

CO-PO MAPPINGS

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	1	1	3	2	1	1	1	2	2	1	3
CO2	2	3	3	1	1	-	1	1	1	1	1	3
CO3	2	3	3	2	2	1	1	1	1	1	-	3
CO4	1	3	3	2	2	-	1	1	1	1	1	3
CO5	2	3	2	2	2	1	1	1	2	2	1	3
AVG	2	3	3	2	2	1	1	1	2	2	1	3

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	2	1
CO3	3	2
CO4	2	1
CO5	3	2
AVG	3	2

JCE1044	TUNNELING ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

On completion of the course, the student is expected to be able to

- To Understand need of utilization of underground space for various applications.
- To study various methods of excavations and tunneling methods.
- Planning and design process of tunnels.
- To identify the suitable method of tunneling.
- To study various types of support system and its merit and demerits.

UNIT I TUNNELS AND UNDERGROUND SPACE APPLICATION 9

History-caves-tunnels for transport-water, power supply-storage of LPG –nuclear waste disposal- defence facilities-submerged tunnels-underground library, museums.

UNIT II EXCAVATION TECHNIQUES 9

Types and purpose of tunnels-choice of excavation methods-soft ground tunneling-hardrock tunneling-tunnel drilling-blasting-impact hammers-problems encountered and remedial measures.

UNIT III PLANNING AND GEOMETRIC DESIGN OF TUNNELS 9

Topographical –geological survey-rock sampling-testing-determination of location size shape and alignment-subsidence problem on soft ground –tunneling design in hard rock.

UNIT IV CONSTRUCTION OF TUNNEL 9

Advanced drilling techniques –TBM-cuttability assessment-shield tunneling-advantages-types of shield tunneling-factors affecting selection of shield-twin tunnel-NATM.

UNIT V DESIGN OF TUNNEL SUPPORTING SYSTEMS AND VENTILATION 9

Classification of supports-active –passive-permanent-temporary-excavation support-steel supports- lining-grouting-ground freezing-environment in underground-various methods of ventilation.

TOTAL: 45 PERIODS

REFERENCES:

1. Underground infrastructure planning design construction-R.K.Goel, Bhavani singh, Jian Zhao, Butterworth heinemunn publishers.
2. Practical tunnel construction, Hemphill G.B 2012 Johnwileyand Son.
3. Introduction to tunnel construction, David chapran, Nicole metse and Alfred stark,Spor press.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
AVG	2	3

JCE1045		L	T	P	C

ROCK MECHANICS

		3	**0**	**0**	**3**

COURSE OBJECTIVES:

On completion of the course, the student is expected to be able to· have

- The knowledge in characterizing and rating the rock mass.
- Arrive at the behaviour of rock for the given project.
- Calculate the insitu stresses of rock.
- Design underground excavation, open excavation and sub-structures.
- Design suitable support system under unstable condition.

UNIT I INTRODUCTION TO COSTING CONCEPTS 9

Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II INTRODUCTION TO PROJECT MANAGEMENT 9

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III PROJECT EXECUTION AND COSTING CONCEPTS 9

Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing – Case Studies.

UNIT IV COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL 9

Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets - Case Studies.

UNIT V QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT 9

Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory- Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES :

At the end of the course, the student will be able to;

1. Describe the costing concepts and their role in decision making.

2. Explain the project management concepts and their various aspects in selection.
3. Interpret costing concepts with project execution.
4. Gain knowledge on costing techniques in service sector and various budgetary control techniques.
5. State the various techniques in quantitative techniques in cost management.

REFERENCES:

1. Ashish K. Bhattacharya, "Principles & Practices of Cost Accounting" Wheeler publisher, 1991
2. Charles T. Horngren and George Foster, "Advanced Management Accounting", 1988
3. Charles T. Horngren et al Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi, 2011
4. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting, 2003
5. Vohra N.D., Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd, 2007

WEBSITE REFERENCES:

1. https://nptel.ac.in/courses/110/107/110107081/
2. https://nptel.ac.in/courses/110/104/110104073/
3. https://nptel.ac.in/courses/105/103/105103093/
4. https://nptel.ac.in/courses/105/104/105104161/
5. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-040-project-management-spring-2009/

CO-PO MAPPINGS

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12
CO1	2	3	-	2	-	-	-	-	-	2	3	2
CO2	2	3	2	2	-	2	2	-	2	3	2	-
CO3	-	-	-	-	-	-	-	3	2	2	-	1
CO4	2	2	2	-	-	2	-	-	-	-	2	-
CO5	-	-	2	-	1	2	2	3	2	-	-	-
AVG	2	3	2	2	1	2	2	3	1	3	2	1

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	2	-
CO2	-	2
CO3	-	2
CO4	-	-
CO5	3	-
AVG	2	2

VERTICAL 4-ENVIRONMENTAL ENGINEERING

JCE1005 Climate Change and its Impact

JCE1013 Municipal Solid Waste Management

JCE1015 Environment and Social Impact Assessment

JCE1022 Industrial Wastewater Treatment

JCE1046 Environmental Health and Safety

JCE1047 Environmental Policy and Legislation

JCE1048 Solid and Hazardous Waste Management

JCE1049 Air and Noise Pollution Control Engineering

JCE1005	CLIMATE CHANGE AND ITS IMPACT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the Earth‟s Climate System and the concept of Global Warming.
- To insight the climate variability and change.
- To comprehend the tools available for vulnerability assessment.
- To gain knowledge on adaptation and mitigation measures.
- To impart knowledge on climate change impact in various sectors.

UNIT I GLOBAL CLIMATE SYSTEM 9

Climate - Drivers of Climate change - Components of Global Climate System: Atmosphere, hydrosphere, Lithosphere, cryosphere and biosphere, atmospheric circulation - redistribution of heat; Global Energy Balance: Greenhouse effect; Hydrological cycle: Reservoirs, flows (or Fluxes) - Residence Times.

UNIT II CLIMATE VARIABILITY AND CHANGE 9

Climate variability and change: Factors Responsible for Natural Climate Variability and Change: large scale variability - El Nino, La Nina - ENSO, Tele-connections, Sun-Moon-Earthinter action - Factors Responsible for Anthropogenic Climate Change, Detection and Attribution of Climate Change; Global and Indian Scenarios - Observed changes and projected changes of IPCC - Impacts on water resources - Scenarios: SRES and RCPs.

UNIT III TOOLS FOR VULNERABILITY ASSESSMENT 9

Need for vulnerability assessment - Approaches for assessment - Types of climate models, History of climate modelling, Sensitivity of climate models, parameterization of climate process, simulation. Box models - Zero - dimensional models - Radioactive-convective models – Higher - dimension models - EMICs (Earth - system models of intermediate complexity) -GCMs (global climate models or general circulation models) - Regional Models - Sectoral models - CMIP (Coupled Model Inter comparison Project)

UNIT IV ADAPTATION AND MITIGATION 9

Water - related adaptation to climate change in the fields of Ecosystems and biodiversity, - Agriculture and food security, land use and forestry, Human health, water supply and sanitation, infrastructure and Economy (insurance, tourism, industry and transportation) - Adaptation, vulnerability and sustainable development Sector - specific mitigation - Carbon dioxide capture and storage (CCS) , Bio - energy crops, Biomass electricity, Hydropower, Geothermal energy, Energy use in buildings, Land - use change and management, Crop land management, Afforestation and Reforestation.

UNIT V CLIMATE CHANGE IMPACT **9**

Impacts of Climate Change on various sectors - Agriculture, Forestry and Ecosystem - Water Resources - Human Health - Industry, Settlement and Society -Types of Agro climatic zones - Methods and Scenarios - Projected Impacts for Different Regions - Uncertainties in the Projected Impacts of Climate Change - Impact in different climatic zones - Risk of Irreversible Changes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Describe earth‟s climate system and the interaction among the subsystems of the earth components.
CO2: Label the basics of climate variability and change including the observations and projections.
CO3: Demonstrate the tools for vulnerability assessment at global and at regional scale.
CO4: Review the options available for adaptation and mitigation for different sectors.
CO5: Record the impact on various sectors andprojected impact on climate change.

TEXT BOOKS:

1. Sangam, S. Mukand, S. Babel and Vishnu, P Pandey, “Climate Change and Water Resources”, CRC Press an imprint of the Taylor & Francis Group, 2014.
2. John, M. Wallace, Peter, V. Hobbs, “Atmospheric Science: An Introductory Survey”, Second Edition, Academic Press an imprint of Elsevier, 2006.
3. Dash, S. Kumar, “Climate Change - An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007.

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1. David, N.J, “Climate Change and Climate Modeling”, University Press,Cambridge, United Kingdom, 2011.
2. Mc Guffie, K, Henderson-Sellers, A, “A Climate Modelling Primer”, Third Edition, John Wiley & Sons, Ltd, 2005.
3. Thomas, T. Warner, “Numerical Weather and Climate Prediction”,Cambridge University Press, New York, 2011.
4. IPCC Fifth Assessment Report – The AR5 Synthesis Report,2013.
5. Jan, C. van Dam, “Impacts of “Climate Change and Climate Variabilityon Hydrological Regimes”, Cambridge University Press, 2003.

WEBSITE REFERENCES:

1. https://www.ipcc.ch/assessment-report/ar6/
2. http://moef.gov.in/division/environment-divisions/climate-changecc-2/documents- publications/
3. https://climate.nasa.gov/
4. https://unfccc.int/
5. https://www.adaptationcommunity.net/?wpfb_dl=236

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1026	INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To have the basic knowledge about the theory of vibration.
- To understand the different types of waves and its behaviour.
- To have enough knowledge about various laboratory and field tests to determine the dynamic soil properties and its interpretation.
- To Assess the contamination in the soil and to select suitable remediation methods based on contamination.
- To Assess the influence of vibrations and selection of remediation methods based on the nature of vibration, properties and behaviour of soil.

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 weightless 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 REMEDIATION 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. Swamisaran, "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 McGraw-Hill, 2007

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1. Kamaswara Rao., "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi,
2. Kameswara Rao., "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003.
3. Moore, P.J., "Analysis and Design of Foundation for Vibration", Oxford and IBH, 2005.
4. Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall, 2014.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	3
AVG	2	2

JCE1013	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJ ECTIVES:

- To acquire knowledge on the various characteristics of solid wastes.
- To learn the various methods of storage and source reduction of solid wastes.
- To plan and design systems for storage, collection, transport and processing.
- To learn solid waste management practices, disposal and recycling.
- To gain knowledge on various methods of waste disposal.

UNIT I SOURCES AND CHARACTERISTICS 9

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management –Requirements and salient features of Solid waste management rules- Role of public and NGO‟s – Elements of Municipal Solid Waste Management Plan.

UNIT II ONSITE HANDLING SOURCE REDUCTION 9

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – biodegradable, non-biogradable, hazardous – Public health and Environmental aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

UNIT III COLLECTION, TRANSFER AND RECYCLING OF WASTES 9

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations – location, operation and maintenance; options under Indian conditions – Field problems- Engineered systems for resources and energy recovery & material recovery systems.

UNIT IV PROCESSING OF WASTES 9

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation Thermal processing options – Dumpsite Management and remedial measures - case studies under Indian conditions**.**

UNIT V WASTE DISPOSAL 9

Land disposal of solid waste- Sanitary landfills – site selection, design criteria and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor - Capping of Dumpsite – Plasma Gasification.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the nature and characteristics of municipal solid wastes.
- Explain the methods of segregation and storage of solid waste.
- Identify the methods of collection, transfer and recycling of solid waste.
- Select methods for processing of municipal solid waste.
- Apply the modern waste management techniques in real time projects.

TEXT BOOKS

1.Cherry P M, “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.

3. Gary C. Young, “Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons”, Wiley, 2010**.**

REFERENCES

1.George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, “Integrated Solid Waste Management”, Mc-Graw Hill India, First edition, 2015.

2. CPHEEO, “Manual on Municipal Solid waste management, Vol I, II and III”, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.

3.William A. Worrell, P. AarneVesilind, Christian Ludwig, “Solid Waste Engineering - A Global Perspective”, 3rd Edition, Cengage Learning, 2017.

4.Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and "Environmental Resources Management, Hazardous waste Management", Mc-Graw Hill International edition, New York, 2010.

5.John Pitchtel, “Waste Management Practices”, CRC Press, Taylor and Francis Group,2014.

WEBSITE REFERENCES

1. https://nptel.ac.in/courses/105/103/105103205/
2. http://www.moef.nic.in/legis/hsm/mswmhr.html
3. http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514- solid waste-management-and-recycling
4. www.epa.gov/tribalmsw/
5. www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf

COs- PO's MAPPING

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	2	2	2	-	-	1	1	1	1	3	1	3
CO2	2	-	-	1	2	3	1	3	1	3	1	3
CO3	-	3	-	1	2	2	1	2	1	3	1	3
CO4	-	-	3	1	3	3	1	3	1	3	1	3
CO5	2	-	3	3	3	3	1	3	1	3	1	3
AVG	2	3	3	1	3	2	1	2	1	3	1	3

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	3
AVG	2	2

JCE1015	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To acquire basic knowledge on Environment Impact Assessment (EIA).
- To learn the different components and methods of EIA.
- To gain knowledge on preparation of an environmental management plan.
- To study the economic analysis of environmental projects.
- To acquire knowledge on EIA in real time projects.

UNIT I INTRODUCTION TO EIA 9

Evolution of EIA - Concepts - Need for Environmental Impact Assessment (EIA) – Environmental Impact Statement (EIS) - EIA Types – EIA in project cycle –EIA Notification and Legal Framework- – Rio Principles of Sustainable Development.

UNIT II COMPONENTS AND METHODS FOR EIA 9

Screening and Scoping in EIA – Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction - Checklists – Analysis of alternatives – Software packages for EIA – Documentation of EIA findings.

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 – Public Hearing-Environmental Clearance.

UNIT IV SOCIAL IMPACT ASSESSMENT 9

Baseline monitoring of Socio-economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts– Cost benefit Analysis -Implementation of mitigation aspects.

UNIT V CASE STUDIES OF EIA 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants – coastal projects.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Demonstrate the basics of EIA.
- Describe the prediction and assessment methodology of environmental impact assessment.
- Plan and monitoring of environmental impact assessments.
- Describe the socio economic impact assessment.
- Review environmental impact assessment reports.

TEXT BOOKS:

1. Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, NewDelhi,1995.

2. R Pannir Selvam and S Karthikeyan ""Environmental and Social Impact Assessment", SPGS Publishers,2009.

3. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

REFERENCES:

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment"Conceptual and Methodological Advances, Edward Elgar Publishing,2003.

2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme,2002.

3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.

4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

5. John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995.

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5. https://openknowledge.worldbank.org/handle/10986/29477

CO-PO MAPPINGS

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12
CO1	2	3	-	2	-	-	-	-	-	2	3	2
CO2	2	3	2	2	-	2	2	-	2	3	2	-
CO3	-	-	-	-	-	-	-	3	2	2	-	1
CO4	2	2	2	-	-	2	-	-	-	-	2	-
CO5	-	-	2	-	1	2	2	3	2	-	-	-
AVG	2	3	2	2	1	2	2	3	1	3	2	1

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	2	
CO2		2
CO3		2
CO4		
CO5	3	
AVG	2	2

JCE1022	INDUSTRIAL WASTEWATER TREATMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the source and types of industrial wastewater and their environmental impacts
- Gain knowledge about industrial wastewater pollution and implement pollution prevention, waste minimization in industries
- To gain knowledge and skills in designing industrial wastewater treatment schemes
- To design water reuse management techniques
- To Conduct research to develop effective management systems for industrial wastewater

UNIT I INTRODUCTION 8

Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling – generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II INDUSTRIAL POLLUTION PREVENTION &WASTE MINIMISATION 8

Prevention vis a vis Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimization Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III INDUSTRIAL WASTEWATER TREATMENT 10

Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation- Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Electro dialysis & Evaporation –Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT 9

Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrialwastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion,conditioning, dewatering and disposal of sludge – Management of ROrejects.

UNIT V CASE STUDIES **10**

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Sugar and Distilleries

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students is expected to be able to,

- Explain the source and types of industrial wastewater and their environmental impacts
- Identify industrial wastewater pollution and implement pollution prevention, waste minimization in industries
- Apply knowledge and skills to design industrial wastewater treatment schemes
- design water reuse management techniques
- Conduct research to develop effective management systems for industrial wastewater

REFERENCES:

1."Industrial wastewater management, treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition, 2008.

2. Lawrance K. Wang, Yung Tse Hung, Howard H.Lo and Constantine Yapijakis "handlook of Industrial and Hazardous waste Treatment", Second Edition, 2004.

3. Metcalf & Eddy, Inc., George Tchobanoglous, Franklin L. Burton and H. David Stensel, Wastewater engineering, treatment and reuse, Fourth Edition, McGraw-Hill, 2017

4. Nelson Leonard Nemerow, " industrial waste Treatment", Elsevier, 2007.

5. Wesley Eckenfelder W., " Industrial Water Pollution Control", Second Edition, Mc Graw Hill, 2000.

6. Paul L.Bishop, Pollution Prevention:- Fundamentals and Practice", Mc-Graw Hill International, Boston, 2000.

7. Waste water Treatment for pollution control and reuse by Soli. J. Arceivala, Shyam. R. Asolekar, Tata McGraw Hill, 2007

COs- PO's & PSO's MAPPING

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

CO\PSO	PSO1	PSO2
CO1	2	-
CO2	-	2
CO3	-	2
CO4	-	-
CO5	3	-
AVG	2	2

JCE1046	ENVIRONMENTAL HEALTH AND SAFETY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To Understand the need for EHS in industries and related Indian regulations
- To know about various types of Health hazards, effect, assessment and control methods
- To learn about the various safety systems in working environments
- To Understand the methodology for preparation of Emergency Plans and Accident investigation
- To know about EHS Management System and its elements

UNIT I INTRODUCTION 9

Need for developing Environment, Health and Safety systems in work places- International initiatives, National Policy and Legislations on EHS in India - Regulations and Codes of Practice - Role of trade union safety representatives - Ergonomics.

UNIT II OCCUPATIONAL HEALTH AND HYGIENE 10

Definition of occupational health and hygiene - Categories of health hazards – Exposure pathways and human responses–Exposure Assessment-occupational exposure limits - Hierarchy of control measures - Role of personal protective equipment and the selection criteria

UNIT III WORKPLACE SAFETY AND SAFETY SYSTEMS 11

Features of Satisfactory and Safe design of work premises – good housekeeping - lighting and color, Ventilation and Heat Control, Noise, Chemical and Radiation Safety – Electrical Safety – Fire Safety – Safety at Construction sites, ETP – Machine guarding – Process Safety, Working at different levels

UNIT IV HAZARDS AND RISK MANAGEMENT 8

Safety appraisal – Job Safety Analysis-Control techniques – plant safety inspection – Accident investigation - Analysis and Reporting – Hazard and Risk Management Techniques –Onsite and Offsite emergency Plans. Employee Participation- Education and Training- Case Studies

UNIT V ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT 7

Concept of Environmental Health and Safety Management – Elements of Environmental Health and Safety Management Policy and implementation and review – ISO 45001-Strucure and Clauses-Case Studies

TOTAL: 45 PERIODS

COURSE OBJECTIVE:

After completion of this course, the students are expected to be able to understand:

- Need for EHS in industries and related Indian regulations
- Various types of Health hazards, effect, assessment and control methods
- Various safety systems in working environments
- The methodology for preparation of Emergency Plans and Accident investigation
- EHS Management System and its elements

REFERENCES

1. Industrial Health and Safety Acts and Amendments, by Ministry of Labour and Employment, Government of India
2. Fundamentals of Industrial Safety and Health by Dr.K.U.Mistry, Siddharth Prakashan, 2012
3. The Facility Manager's Guide to Environmental Health and Safety by Brian Gallant, Government Inst Publ., 2007.
4. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services, 2005.
5. Environmental and Health and Safety Management by Nicholas P.Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995

COs- PO's & PSO's MAPPING

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	-
CO2	2	-
CO3	-	-
CO4	2	-
CO5	-	-
AVG	2	-

JCE1047	ENVIRONMENTAL POLICY AND LEGISLATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand origins and sources of environmental laws
- Understand the key principles of, and actors within, environmental laws
- Understand the National Environmental Policy and Various Legislations enacted in line with Policy
- TO analyze environmental laws within various contexts and to evaluate laws against procedural and substantive criteria.
- Understand and the Legal system operating in India

UNIT I INTRODUCTION TO ENVIRONMENTAL LEGISLATIONS AND INTERNATIONAL SCENARIO 9

Significance of Environmental Law -International Environmental Law -Development of International Environmental Law -Source and General principals of International Environmental Law –General rights and obligations of States -General Issues of the international law related to environmental protection -Stockholm Declaration-Rio Declaration on Environment and Development-Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and their disposal- Convention of Biological Diversity-U.N Frame Work Convention on Climate Change-Montreal Protocol on Substances that deplete Ozone Layer-Kyoto Protocol.

UNIT II INDIAN CONSTITUTIONS AND ENVIRONMENTAL PROTECTION 9

Indian Constitution and Environmental Protection -Constitutional provisions concerning Environment Articles 14,15,(2) (b) 19 (e),21,31,32,38,39,42,47, 48-A,49,51,51-A: Indian Environmental Policy 2006 Administrative machinery for pollution control Common Law & Criminal Law Nuisance, Negligence, Strict liability and Absolute liability, Provisions of IPC relating to environmental problems (public nuisance u/s 268 and others (Sections 269,270,277,284,285,286,425 to 440) Section 133 of Cr.P.C.

UNIT III REMEDIES FOR ENVIRONMENTAL POLLUTION 9

Common Law Remedies/Remedies under Law of Tort – Penal Remedies – Indian Penal Code and Code of Criminal Procedure – Remedies under Constitutional Law – Writs – Public Interest Litigation- Public Liability Insurance Act, 1991 – The National Green Tribunal Act 2010

UNIT IV MAJOR INDIAN LEGISLATIONS 9

Water Act (1974) Air Act (1981) Environmental Protection Act (1986) Major Notifications, The Municipal solid Wastes (Management and Handling) Rules 2000-Bio Medical Wastes (Management and Handling) Rules 1998- Hazardous Wastes (Management and Handling Rules 1989-Environment Impact Assessment Notifications- Coastal Regulation Zone Notification-Public Hearing Notifications

UNIT V ENVIRONMENT AND DEVELOPMENT CASE LAWS 9

Meaning and concept of development - Its impact on environment; conflict between environment and development, Concept of Sustainable Development., Polluter Pay Principle, Precautionary Principle, Public Trust Doctrine. Landmark Judgments - Olium gas leakage case, Rural Litigation and Entitlement Kendra, Dehradun, (1985) Supp SCC 487) Vellore Citizen Welfare Forum v. Union of India, (1996) 5SCC 647) Ganga Pollution case (1988) I SCC) S. Jagannath v. UOI (1997) SCC867) Vellore Citizens welfare forum case M.C. Mehta V. Kamalnath (1997) I SCC 388)

TOTAL: 45 PERIODS

COURSE OUTCOME:

- Gained knowledge about the origins and sources of environmental laws
- Understood the key principles of, and actors within, environmental laws
- Understood the National Environmental Policy and Various Legislations enacted in line with Policy
- Gained knowledge about the environmental laws within various contexts and to evaluate laws against procedural and substantive criteria.
- Understood and the Legal system operating in India

REFERENCES

1. Leelakrishnan P., Environmental Law in India, Butterworths,1998
2. Leelakrishnan P., Environmental Case Book, Lexis Nexis, 2000
3. Shanthakumar S. , Environmental Law – An Introduction, Butterworths,2004
4. Shyam Diwan and Armin Rosencranz, Enviromental Law and Policy in India, Oxford, 2001

COs- PO's & PSO's MAPPING

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

CO\PSO	PSO1	PSO2
CO1	3	-
CO2	3	-
CO3	3	-
CO4	-	-
CO5	3	2
AVG	3	2

JCE1048	SOLID AND HAZARDOUS WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- Explain the various functional elements of solid and hazardous waste management
- to characterize different types of solid and hazardous wastes,
- Design of systems and processes to meet specified needs of waste minimization, storage, collection, transport, recycling, processing and disposal.
- Select appropriate methods for processing and disposal of solid and hazardous wastes
- Conduct research pertinent to solid and hazardous waste management

UNIT I WASTE CLASSIFICATION AND REGULATORY REQUIREMENTS 9

Sources and types of solid and hazardous wastes - need for solid and hazardous waste management– salient features of latest Indian legislations on management and handling of solid wastes, hazardous wastes, biomedical wastes, electronic wastes, construction and demolition wastes, plastics and discarded lead acid batteries – elements of integrated waste management and roles of stakeholders - seven elements and seven step approach to integrated solid waste management planning.

UNIT II WASTE CHARACTERIZATION SOURCE REDUCTION AND RECYCLING 9

Waste sampling and characterization plan - waste generation rates and variation – physical composition, chemical and biological properties – hazardous characteristics – ignitability, corrosivity and TCLP tests –source reduction, segregation and onsite storage of wastes – waste exchange - extended producer responsibility - recycling of plastics, C&D wastes and E wastes.

UNIT III WASTE COLLECTION TRANSPORT AND MATERIAL RECOVERY 9

Door to door collection of segregated solid wastes - analysis of hauled container and stationery container collection systems - compatibility, storage, labeling and handling of hazardous wastes – principles and design of transfer and transport facilities - hazardous waste transport and manifests - mechanical processing and material separation technologies – Size reduction – size separation - density separation - magenetic separation – compaction – principles and design of material recovery facilities – physico chemical treatment of hazardous wastes - solidification and stabilization – case studies on waste collection and material recovery

UNIT IV BIOLOGICAL AND THERMAL PROCESSING OF WASTES 9

Biological and thermos-chemical conversion technologies – composting – biomethanation – incineration – pyrolysis- plasma arc gasification –principles and design of biological and thermal treatment facilities - MSW processes to energy with high-value products and specialty By-products- operation of facilities and environmental controls - treatment of biomedical wastes – case studies and emerging waste processing technologies.

UNIT V WASTE DISPOSAL 9

Sanitary and secure landfills - components and configuration– site selection - liner and cover systems - geo synthetic clay liners and geo membranes - design of sanitary landfills and secure landfills- leachate collection, treatment and landfill gas management – landfill construction and operational controls - landfill closure and environmental monitoring – landfill bioreactors – rehabilitation of open dumps and biomining of dumpsites-remediation of contaminated sites-Case studies

TOTAL: 45 PERIODS

COURSE OBJECTIVE

- Learnt the various functional elements of solid and hazardous waste management
- Gained knowledge about the different types of solid and hazardous wastes,
- Learnt about design of systems and processes to meet specified needs of waste minimization, storage, collection, transport, recycling, processing and disposal.
- Gained knowledge about the methods for processing and disposal of solid and hazardous wastes
- Understood the research pertinent to solid and hazardous waste management

REFERENCES:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, “Integrated Solid Waste Management, Mc-Graw Hill India, First edition, 2015.
2. CPHEEO, “Manual on Municipal Solid waste management,Vol I, II and III, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.
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5.John Pitchtel,Waste Management Practices, CRC Press,Taylor and Francis Group,2014.
6. Gary C. Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010
7. Cherry P M, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018.
8. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management – Science and Engineering , Butterworth-Heinemann, 2016

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CO1	-	3	-	-	2	2	-	-	-	-	-	-
CO2	3	2	-	2	2	-	-	-	2	-	-	-
CO3	-	-	3	-	-	-	-	-	2	-	-	-
CO4	-	2	-	-	2	2	2	2	-	-	2	-
CO5	-	2	-	2	-	-	-	-	-	1	-	1
AVG	3	2	3	2	2	2	2	2	2	1	2	1

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	2	2
CO3	3	2
CO4	3	2
CO5		2
AVG	3	2

JCE1049	AIR AND NOISE POLLUTION CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand various types and sources of air pollution and its effects
- Know the dispersion of air pollutants and their modeling
- Know about the principles and design of control of particulate pollutants
- Understand the principles and design of control of gaseous pollutant
- Know the sources, effects and control of vehicular, indoor air and noise pollution

UNIT I GENERAL 9

Atmosphere as a place of disposal of pollutants – Air Pollution – Definition - Air Pollution and Global Climate - Units of measurements of pollutants - Air quality criteria - emission standards - National ambient air quality standards - Air pollution indices - Air quality management in India.

UNIT II SOURCES, CLASSIFICATION AND EFFECTS 9

Sources and classification of air pollutants - Man made - Natural sources - Type of air pollutants - Pollution due to automobiles - Analysis of air pollutants - Chemical, Instrumental and biological methods.Air pollution and its effects on human beings, plants and animals - Economic effects of air pollution - Effect of air pollution on meteorological conditions - Changes on the Meso scale, Micro scale and Macro scale.

UNIT III SAMPLING, METEOROLOGY AND AIR QUALITY MODELING 9

Sampling and measurement of particulate and gaseous pollutants - Ambient air sampling - Stack sampling. Environmental factors - Meteorology - temperature lapse rate and stability – Adiabatic lapse rate - Wind Rose - Inversion – Wind velocity and turbulence - Plume behavior - Dispersion of air pollutants- Air Quality Modeling.

UNIT IV AIR POLLUTION CONTROL MEASURES 9

Control - Source correction methods - Control equipments - Particulate control methods – Bag house filter - Settling chamber - cyclone separators - inertial devices - Electrostatic precipitator - scrubbers- Control of gaseous emissions - Absorption - Absorption equipments - adsorption and combustion devices (Theory and working of equipments only).

UNIT V NOISE POLLUTION AND ITS CONTROL 9

Sources of noise – Units and Measurements of Noise - Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise – General Control Measures – Effects of noise pollution – auditory effects, non-auditory effects. Noise Menace–

Prevention and Control of Noise Pollution – Control of noise at source, control of transmission, protection of exposed person - Control of other types of Noise Sound Absorbent

TOTAL: 45 PERIODS

COURSE OUTCOME:

- Understood the various types and sources of air pollution and its effects
- Learnt about the dispersion of air pollutants and their modeling
- Gained knowledge about the principles and design of control of particulate pollutants
- Understood the principles and design of control of gaseous pollutant
- Gained knowledge about the sources, effects and control of vehicular, indoor air and noise pollution

TEXTBOOKS:

1.C. S. Rao, “Environmental Pollution Control Engineering”, Wiley Eastern Limited, 2006.
2.M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 2017
3.Dr. Y. Anjaneyulu, “Air Pollution and Control Technologies”, Allied publishers Pvt. Ltd., 2019.

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1.Noel De Nevers, "Air pollution control Engineering", McGraw Hill International Edition, McGraw Hill Inc, New Delhi, 2000.
2.Air Pollution act, India, 1987
3.Peterson and E.Gross Jr., “Hand Book of Noise Measurement”, 7th Edition, 1974
4.Mukherjee, "Environmental Pollution and Health Hazards", causes and effects, 1986
5.Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 1979.
6.Kenneth wark, Cecil F.Warner, “Air Pollution its Origin and Control”, Harper and Row Publishers, New York, 1998.

COs- PO's & PSO's MAPPING

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

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	2	2
CO3	3	2
CO4	3	2
CO5	-	2
AVG	3	2

VERTICAL 5 - HYDROLOGY AND WATER RESOURCES ENGINEERING

JCE1010 Surface Hydrology

JCE1014 Groundwater Hydrology and Modeling

JCE1021 River Basin Management

JCE1028 Integrated Water Resources Management

JCE1050 Groundwater Engineering

JCE1051 Water Resource System Engineering

JCE1052 Watershed Conservation and Management

JCE1053 Water Quality and Management

JCE1010	SURFACE HYDROLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the various components of hydrologic cycle for rainfall prediction.
- To study the abstraction from rainfall prediction.
- To acquire knowledge on the unit hydrograph techniques and its applications.
- To study the various methods of flood routing.
- To gain knowledge on the storm water management in urban watershed.

UNIT I PRECIPITATION 9

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.

UNIT II ABSTRACTION 9

Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall.

UNIT III HYDROGRAPHS 9

Factors affecting Hydrograph - Baseflow separation - Unit hydrograph - Derivation of unit hydrograph - S curve hydrograph - IUH - Synthetic Unit Hydrograph.

UNIT IV FLOOD AND FLOOD ROUTING 9

Flood frequency studies - Recurrence interval - Gumbel's method - Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control – Flood Plain Zoning.

UNIT V URBAN HYDROLOGY 9

Storm water runoff generation - Hydrologic risk; Frequency analysis - Design storm; Open channel flow in urban watershed - Estimation of runoff rates from urban watersheds; Flow routing; Storm water drainage structures; storm water detention; structural and non-structural control measures – urban hydrology modelling.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Define the key drivers on water resources and hydrological processes in catchments.
- Analyze the abstraction from rainfall prediction.
- Explain the concept of hydrological extremes such as flood & drought and management strategies.
- Apply various methods of flood routing.
- Demonstrate the urban storm water management strategies.

TEXT BOOKS:

1. Subramanya.K. "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Dr.Jaya Rami Reddy, " A Text Book of Hydrology" , University Science Press, LaxmiPublications, second edition, 2011.
3. Hormoz Pazwash , “Urban Storm water management” CRC Press ,2011.

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1. Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
2. Raghunath.H.M., "Hydrology", Wiley Eastern Ltd., 1998.
3. Ernest W. Tollner, "Engineering Hydrology for Natural Resources Engineers"Wiley-Blackwell; 2 edition (October 17, 2016)
4. James C Y Guo, “Urban Flood Mitigation and Stormwater Management”,CRC Press ,2011

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2. https://nptel.ac.in/courses/105/101/105101002/
3. https://nptel.ac.in/courses/105/107/105107129/
4. https://mausam.imd.gov.in/
5. http://www.imdchennai.gov.in/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	1	3
CO5	1	3
AVG	1	3

JCE1014	GROUND WATER HYDROLOGY AND MODELING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the hydrogen logical parameters and groundwater governing equations.
- To learn the well hydraulics of different aquifer system.
- To study the importance of groundwater quality.
- To introduce the various geophysical methods to estimate groundwater potential.
- To study the groundwater flow modeling and management.

UNIT I HYDROGEOLOGICAL PARAMETERS 9

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, trans emissivity 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 - These method - Jacob method – Chow‟s method – Law of Times – These Recovery – Slug method – Estimation of aquifer parameter - Image well theory – Partial penetrations of wells – Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery - well interface and optimum spacing of well.

UNIT III 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 IV GROUNDWATER PROSPECTING 9

Investigation and evaluation – Geophysical methods- Electrical Resistivity methods – Interpretation of data – Seismic method – Subsurface investigation – Test drilling – Resistivity logging – Application of remote sensing techniques.

UNIT V GROUNDWATER FLOW MODEL 9

Physical models – Analog models – Mathematical modeling – Numerical modeling of groundwater flow –Conceptualization of aquifer system - Groundwater contamination transport modelling, restoration and management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Explain the aquifer properties.
- Estimate the aquifer parameters.
- Summarize the properties of groundwater quality.
- Explain the geophysical methods for subsurface investigation and remote sensing techniques.
- Analyse the aquifer system for better management of groundwater resources.

TEXT BOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, NewDelhi, 2010.
2. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
3. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCES:

1. Rastogi A.K., “Numerical Groundwater Hydrology”, Penram International Publishing 2012.
2. Chahar BR, “Groundwater hydrology”, McGraw Hill Education (India) Pvt Ltd, New Delhi,2015.
3. Ramakrishnan, S, “Ground Water”, K.J. Graph arts, Chennai, 1998.
4. Rushton K.R., “Groundwater Hydrology: Conceptual and Computational Models”, Wiley,2003.
5. Anderson M.P., and Woessner W.W., “Applied Groundwater Modelling: Simulation of flowand advective transport”, Academic Press, Inc., 1992.

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1.https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-72-groundwater-hydrology-fall-2005/lecture-notes/

2. https://nptel.ac.in/courses/105/103/105103026/

3. https://nptel.ac.in/courses/105/105/105105042//

4. http://cgwb.gov.in/

5. https://www.groundwatertnpwd.org.in/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	1	3
CO5	1	3
AVG	1	3

JCE 1021	RIVER BASIN MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the theoretical background of river basin
- To identify and explore the various river basins in India and Tamil Nadu
- To illustrate water resources planning and management through case studies
- To enrich students the use of river basins and the impact of anthropogenic activities
- To expose students about the concept of sustainability in water resources

UNIT I INTRODUCTION TO RIVER BASINS 9

River systems-Water and river basin management in India-Upstream-downstream demands-Quality problems downstream-Environmental Flows-Shared Rivers-Water conflict resolution - Requirements for integrated river basin management

UNIT II RIVER SYSTEMS AND HUMAN INTERFERENCES 9

River Basins - River Functions – Human Interventions and Impacts – river Basins in India – RiverBasins of Tamil Nadu – Related Case Studies

UNIT III RIVER BASIN PLANNING AND MANAGEMENT 9

Water Resources Planning in River Basins, Operational Management, Economics and Finance – Case Studies

UNIT IV RIVER BASIN MANAGEMENT 9

River basin management - Principles of planning processes-Water availability assessment – Surface water and groundwater-Water demand assessment: municipal, industrial, agricultural and environmental-Water allocation - Principles and policies-Case studies- Impacts of anthropogenic activities and climate change on water resources.

UNIT V SUSTAINABILITY IN RIVER BASIN MANAGEMENT 9

Sustainability indicators- resources depletion, growth models -Planetary System Boundaries - inter-connected world Stakeholders in sustainability - Sustainability criteria (ecological, economic,institutional, social) - Status and challenges regarding sustainability and river basin management - multi-criteria decision support - Case Studies

TOTAL: 45 PERIODS

COURSE OUTCOMES

- Extend the fundamentals and basic concepts of river basin
- Identify various river basins
- Plan and manage water resources
- Assess the water demand and allocate the water resources
- Comprehend the need and way of sustaining river basins

TEXT BOOKS

1. A Handbook for Integrated Water Resources Management in Basins Published by Global Water Partnership and International Network of Basin Organizations (INBO).
2. Lawrence K. Wang and Chih Ted Yang, "Modern Water Resources Engineering", Humana Press Edition

REFERENCES:

1. A.Mohanakrishnan, Water Resources Development and Management, (Pub. No. 43), IMTI.2014
2. A. Mohanakrishnan, History of the Sathanur Reservoir Project in the Penniyaru River Basin,2012.
3. Santosh Kumar Garg "Irrigation Engineering and Hydraulic Structure", Khanna Publishers.
4. V. T Chow., D. R Maidment and L. W. Mays, "Applied hydrology", Tata McGraw Hill Education Pvt. Ltd, (2011), New Delhi.
5. Mays L.W., "Water Resources Engineering", Wiley India Pvt. Ltd, (2013).

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2. http://www.universitywaterspectrumpartnership.org.
3. https://www.un-ihe.org/watershed-and-river-basin-management
4. http://www.universitywatersectorpartnership.org/curriculum-development/01-irbm-and sustainable-watershed-management/1-1-definition-of-terminologies-and-basic- concepts Integrated River Basin Management
5. http://www.icpdr.org/main/dba-2013.

CO-PO MAPPINGS

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	3
CO2	2	2
CO3	2	3
CO4	1	3
CO5	1	2
AVG	2	2

JCE 1028	INTEGRATED WATER RESOURCES MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart fundamental knowledge on IWRM framework
- To explain students about concepts of IWRM
- To gain knowledge in emerging issues in water management, flood, drought, pollution and poverty
- To understand the water resources development in India and waste water reuse
- To illustrate about urban water resources management

UNIT I IWRM FRAMEWORK 9

Definition – Objectives – Principles - Evolution of IWRM –Key elements of IWRM - IWRM relevance in water resources management – Paradigm shift: Processes and prospective outcomes

UNIT II CONTEXTUALIZING IWRM 9

UN formulations - SDG goals - IWRM in Global, Regional and Local water partnership – Institutional transformation - Bureaucratic reforms - Inclusive development

UNIT III EMERGING ISSUES IN WATER MANAGEMENT 9

Emerging Issues - Complexity in IWRM process -Drinking water management in the context of climate change - IWRM and irrigation - Flood – Drought – Pollution – Linkages between water, health and poverty

UNIT IV IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA 9

Rural Development - Ecological sustainability- -Watershed development and conservation - Ecosystem regeneration – Wastewater reuse - Sustainable livelihood - Food security

UNIT V URBAN WATER RESOURCES MANAGEMENT 9

Urban water cycle - Influencing Factor and associated issues for the rapid urbanizations –IWRM concepts and applications to urban water management – Integrated urban water planning - Storm / Flood - Overview and challenges to urban areas

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Assess the basics of IWRM framework
- Disseminate knowledge on SDG goals
- Identify the linkage between water, health and poverty
- Perform waste water reuse and watershed conservation
- Execute integrated urban water planning

TEXT BOOKS:

1. Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. 2003.

2. Mollinga .P., Ajaya Dixit and Kusum Athukorala " Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006

3. Sarbukkan M.M. "Integrated Water Resources Management", CBS Publishers & Distributors, First edition, 2013.

REFERENCES:

1. Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper, Global water partnership, Stockholm, Sweden.

2. Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper, Global water partnership, Stockholm, Sweden.

3. Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background Paper, Global water partnership, Stockholm, Sweden.

4. Technical Advisory Committee, "Dublin Principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management", Technical Advisory Committee Background Paper, Global water partnership, Stockholm, Sweden.

5. Technical Advisory Committee, "Water as social and economic good: How to put the principles to practice". Technical Advisory Committee Background Paper No: 2. Global water partnership, Stockholm, Sweden.

WEBSITE REFERENCES:

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3. http://www.water-msc.org/en/wrem303.htm
4. https://wlc.unu.edu/courses/course-v1:UNU-INWEH+INWEH-11+2021T1

5. https://repository.tudelft.nl/islandora/object/uuid%3A07e6d251-e4d6-4a7e-bc55-c2260e5ebeee

Mapping of PO with CO

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

Mapping of PSO with CO

CO\PSO	PSO1	PSO2
CO1	2	3
CO2	1	2
CO3	2	2
CO4	1	3
CO5	2	2
AVG	1	2

JCE 1050	GROUNDWATER ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVE: This subject aims to understand the concepts of assessing and utilizing groundwater and wells.

UNIT I INTRODUCTION **7**

Purpose and Objectives- Groundwater monitoring programme- Essentials of groundwater modeling and management- India and Tamil Nadu scenario.

UNIT II GROUNDWATER DATABASE **9**

Formation, identification and evaluation of Geological-geomorphological-hydrometeorological-hydrogeological-G.I.S.soft computing–estimation of aquifer propertiesgeophysical surveys-Governing equations of ground water flow.

UNIT III WELL HYDRAULICS AND DESIGN **12**

Evaluation of Aquifer Parameters- Transmissivity and Storage coefficient-Pumping teststeady state analysis-Dupuit Forcheimer assumptions and derivations- unsteady state analysis-Theis-Jacob method-concept of image well theory. Design characteristicssedimentary-igneous-metamorphic-alternate well design-design problems-location and number-diameter-casing and screening-development-well efficiency.

UNIT IV WELL CONSTRUCTION AND MAINTENANCE **7**

Drilling principles -methods-application-monitoring well drilling methods-well development-gravel packing- well casing- drill pipe, plumpness and alignmentsterilization- Well maintenance- dewatering.

UNIT V SPECIAL TOPICS **10**

Wells in hard rock area- Pumps and pumping performance- Artificial rechargeGroundwater regulation- Sea water intrusion- MODFLOW principles.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Raghunath, H.M., “Groundwater Hydrology”, Second reprint, Wiley Eastern Ltd., New Delhi, 2000.
2. Michael D.Campbell and Jay H.Lehr., “Water Well Technology”, McGraw-Hill Book Company, New Delhi, 2000.

REFERENCES:

1. Todd, D.K., “Groundwater Hydrology”, John Wiley and Sons, New York, 1994.
2. Fletcher.G.Driscoll, “Groundwater and Wells”, Johnson Revision, New York, 1987.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1051	Water Resources Systems Engineering	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the student to the concept of Mathematical approaches for managing the water resources system.
- To make the students apply an appropriate system approach to optimally operate a water
  resource system.

UNIT I SYSTEM APPROACH **9**

Definition, classification, and characteristics of systems – Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – steps in systems engineering.

UNIT II LINEAR PROGRAMMING **9**

Introduction to Operation research – Linear programming Problem Formulation-graphical solution- Simplex method –Sensitivity analysis – application to operation of single purpose reservoir

UNIT III DYNAMIC PROGRAMMING **9**

Bellman's optimality criteria, problem formulation and solutions – Water Allocation for three state (user), Forward and Backward Recursion techniques in Dynamic Programming – Shortest pipe line route problem – Application to reservoirs capacity expansion

UNIT IV SIMULATION **9**

Basic principles and concepts – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic simulation – Rule Curve development for reservoir

UNIT V ADVANCED OPTIMIZATION TECHNIQUES **9**

Integer and parametric linear programming – Goal programming types – Applications to reservoir release optimization – application of evolutionary algorithms like Genetic algorithm, Particle swarm, Simulated Annealing to reservoir release optimization

TOTAL PERIODS :45

TEXT BOOK:

1. Vedula, S., and Majumdar, P.P. "Water Resources Systems" – Modeling Techniques and Analysis Tata McGraw Hill, 5th reprint, New Delhi, 2010.

REFERENCES:

1. Hall Warren, A. and John A. Dracup., "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998
2. Chadurvedi M.C., "Water resource Systems Planning and Management", Tata McGraw Hill inc., New Delhi,1997
3. Taha H.A., "Operation Research", McMillan Publication Co., New York, 1995.
4. Maass A., Husfchimidt M.M., ,Dorfman R., ThomasH A., Marglin S.A and Fair G. M., "Design of Water Resources System", Hardward University Press, Cambridge, Mass.,1995.
5. Goodman Aluvin S., "Principles of Water Resources Planning", Prentice Hall of India, 1984

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1052	WATERSHED CONSERVATION AND 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

COURSE OUTCOME :

- The students will able to apply the knowledge of overall concepts of watershed which would help to comprehend and analyze for better management.

REFERENCES:

1. Ghanashyam Das, Hydrology and Soil Conservation engineering, Prentice Hall of India Private Limited, New Delhi, 2000.
2. Glenn O. Schwab, Soil and Water Conservation Engineering, John Wiley and Sons, 1981.
3. Gurmail Singh, A Manual on Soil and Water Conservation, ICAR Publication, New Delhi, 1982.
4. Suresh, R. Soil and Water Conservation Engineering, Standard Publication, New Delhi, 1982. 5. Vir Singh, Raj, Watershed Planning and Management, Yash Publishing House, Bikaner, 2000. 6. 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. Ames, Iowa. 502 pp. Heathcote, I. W. Integrated Watershed Management: Principles and Practice. 1988. John Wiley and Sons, Inc., New York.
7. Lal, Ruttan. 2000. Integrated Watershed Management in the Global Ecosystem. CRCPress, New York.
8. Heathcote, I. W. Integrated Watershed Management: Principles and Practice. John Wiley and Sons, Inc., New York, 1988.
9. Dhruva Narayana, G. Sastry, V. S. Patnaik, "Watershed Management", CSWCTRI, Dehradun, ICAR Publications, 1997

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1053	WATER QUALITY AND MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

To provide knowledge of aquatic ecology, water pollution, water quality standards, water quality assessment and its management.

UNIT I Introduction **7**

Water resources and its usage including livelihood- Water cycle and water budget-Freshwater-Competitive uses of water

UNIT II Aquatic Ecology **9**

Ecology and ecosystem- River and lake ecology- Stratification and structure of water masses-Aquatic plants and animals

UNIT III Water Pollution **9**

Types and sources of water pollution-Point and nonpoint pollution sources-Effects of pollution (river, lake and reservoir)-Pollution of groundwater

UNIT IV Water Quality Standards **10**

Domestic -Agriculture-Street washing-Firefighting- Swimming pools , fountains and cascade-Steam. power and other industrial process- Commercial- Public use: parks, street washing, sewer cleaning- Developing animal husbandry- Transporting sewage-Recreation

UNIT V Water Quality Assessment and Management **10**

Waste loads and assimilative capacity of receiving waters (surface and ground) - River water quality, stream flow -DO sag curve, its model and application-Lake water quality-Eutrophication control,- Water quality monitoring, management planning, and River catchment management

TOTAL: 45 PERIODS

COURSE OUTCOME :

To provide knowledge of aquatic ecology, water pollution, water quality standards, water quality assessment and its management.

References:

1. Andrew D. Eaton, Lenore S. Clesceri, and Arnold E. Greenberg, 'Standard Methods for the Examination of Water and Wastewater",
2. A.K. Deo, "Environmental Chemistry"
3. C. S. Rao, 'Environmental Pollution Control Engineering', Wiley eastern ltd.
4. Robert V. Thomann, John A. Mueller, " Principles of Surface Quality Modeling and Control'
5. WHO Guidelines for Drinking-water Quality

CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12
CO1	3	3	1	1	-	1	1	1	1	2	1	2
CO2	3	3	1	1	-	1	1	1	1	2	1	2
CO3	3	3	1	1	-	1	1	1	1	2	1	2
CO4	3	3	1	1	-	1	1	1	1	2	1	2
CO5	3	3	1	1	-	1	1	1	1	2	1	2
AVG	3	3	1	1	-	1	1	1	1	2	1	2

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

VERTICAL 6 - STRUCTURAL ENGINEERING

JCE1016 Industrial Structures

JCE1024 Repair and Rehabilitation of Structure

JCE1020 Prestressed Concrete

JCE1019 Structural Dynamics and Earthquake Engineering

JCE1023 Tall Structures

JCE1054 Finite Element Method

JCE1055 Prefabricated Structures

JCE1056 Energy Efficient Buildings

		L	T	P	C
JCE1016	INDUSTRIAL STRUCTURES	3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on classification of industrial structures.
- To learn the functional requirements for services such as power source, water source, sewer disposal
- To study the layout planning and designing based on factory requirements.
- To gain knowledge on Preliminary design of steel structures like bunkers, silos, towers, ducts.
- To learn the various pre-engineered structures.

UNIT I PLANNING 9

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS 9

Lighting – Natural and artificial – protection from the sun – skylight, Services, Layout, wiring fixtures, cable and pipe bridges – Electrical installations – lighting - Substations – effluent, Ventilation and fire protection, ventilation & air – conditioning, fire escapes and, chutes, fire alarms, extinguishers and hydrants.

UNIT III PLANNING AND DESIGN OF R.C. STRUCTURES 9

Requirement of factory and other rules - Layout stages. Loading Design of single bay and design of multi bay multi storied frames in RCC and steel – Analysis of industrial structures - Silos and bunkers – Chimneys – Principles of folded plates and shell roofs – R.C. ducts

UNIT IV DESIGN OF STEEL STRUCTURES 9

Transmission Lines Towers – pipe / cable racks- Chimney. Industrial roofs – Cranes - Different types - Principles - design of girder – Mill buildings – Design of Bunkers – open web and solid web bunkers – Design of Silos

UNIT V PRE-ENGINEERIED BUILDING 9

Expansion joints- design of machine foundations and other foundations as per I.S. Code - Water proofing – roof drainage – joints – sound, shock proof mountings - Principles of prefabrication Prestressed precast roof trusses- Functional requirements for Precast concrete units

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Describe the various types of industries and industrial structures.
- Demonstrate the functional requirements for industrial structures.
- Plan and design special RC structures.
- Design special steel structures.
- Describe the principles of prefabrication & prestressing in industrial structures.

TEXT BOOKS:

1. Ramamrutham.S., "Design of Reinforced Concrete Structures", Dhanpat Rai PublishingCompany, 2007.
2. Ramachandra and Virendra Gehlot, "Design of steel structures -Vol. 2", Scientific Publishers,2012.
3. Subramanian, N., "Design of Steel Structures", Oxford University Press, 2008.

REFERENCES:

1. Henn W. "Buildings for Industry, Vol.I and II", London Hill Books, 1995.
2. Handbook on Functional Requirements of Industrial buildings, SP32-1986, Bureau of IndianStandards, 1990.
3. Handbook of Industrial Lighting, Stanley L.Lyons, Butterworths, London.1981.
4. Koncz, J., Manual of Precast Construction Vol. I and II, Bauverlay GMBH, 1971.
5. Handbook on Precast Construction, An Indian Concrete Institute Publication, 2016.

WEBSITE REFERENCES:

1. https://nptel.ac.in/courses/105/106/105106113/
2. https://www.coursera.org/lecture/uva-darden-foundations-business - strategy/analyzing-industry-structure-gtc74
3. https://www.coursera.org/lecture/innovative-ideas/industry-structure-Yo3XL
4. https://www.coursera.org/lecture/uva-darden-foundations-business-strategy/module - lessons-DdQAC
5. https://nptel.ac.in/courses/105/105/105105162/

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1
AVG	1	1

JCE1019	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the behavior of dynamic loading.
- To expose the Formulation of equation of motion for multi degree of freedom (MDOF) system
- To enrich students about Elements of Engineering Seismology.
- To Study the effect of earthquake loading on the behavior of structureS.
- To understand the Codal provisions to design the structures as earthquake resistant.

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 – Critical damping-Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II MULTI DEGREE OF FREEDOM SYSTEM 9

Formulation of equation of motion for multi degree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods. Spring in parallel and series.

UNITIII INTRODUCTION TO EARTHQUAKE ENGINEERING 9

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seismo-tectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters - Case study of recent earthquake.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9

Effect of earthquake on different types of structures – Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra of residential building.

UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

TOTAL: 45 PERIODS

COURSE OUTCOMES

- Describe the fundamentals behavior of dynamic loading.
- Formulate equation of motion for multi degree of freedom (MDOF) system
- Describe the Earthquake Parameters.
- Analyse earthquake loading on the behavior of structures.
- Comprehend Earthquake resistant design of R.C.C. buildings.

TEXT BOOKS:

1. Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CBS publishers, 2017.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2012.
3. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 2011
4. Humar.J.L, Dynamics of Structures, Prentice Hall Inc., 2021.
5.Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2017.

REFERENCES:

1.Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 2005.
2. Jai Krishna, Chandrasekaran.A.R., and Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers, 2014.
3. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2012.
4. IS13920-1993 Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice.
5. IS 1893 part 1 2002 Indian standard criteria for earthquake resistant design of structures.
6. IS 4326-1993 Earthquake Resistant Design and Construction of Buildings-Code of Practice (Second Revision)

WEBSITE REFERENCES:

1. http://nptel.ac.in/courses/105103093/15
2. http://nptel.ac.in/courses/1234510093/14
3. What are the Effects of Earthquake on Structures? - The Constructor
4. Response spectra (slideshare.net)
5. Microsoft Word - HD8 prop damped modal analysis.doc (tamu.edu)

Mapping of PO with CO

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

Mapping of PSO with CO

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	2
CO3	2	2
CO4	1	2
CO5	1	3
AVG	1	2

JCE1023	TALL STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the Tall Building in the Urban areas
- To study about dispersion of vertical forces
- To illustrate about Bearing Wall Structure.
- To analyze and design of buildings.
- To design the high rise building structures

UNIT I INTRODUCTION **9**

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material

UNIT II VERTICAL STRUCTURE PLANE **9**

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behavior of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UNIT III COMMON HIGH-RISE BUILDING STRUCTURES **9**

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss – Rigid frame-Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS **9**

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings- Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure

UNIT V OTHER HIGH-RISE BUILDING STRUCTURE **9**

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- Describe the fundamentals Tall Building in the Urban areas
- Formulate principles for dispersion of vertical forces.
- Describe the Bearing Wall Structure.
- Analyze and design of buildings.
- Comprehend design of high rise building structures.

TEXT BOOKS:

1. Wolfgang Schueller " High - rise building Structures", John Wiley and Sons.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 2011.
3. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., South Asian Publishers, New Delhi.
4. Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications. Hel wany, S.(2017).
5. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi. (2012).
6. Advanced Design of Concrete Structures Krishna Raju N., Tata Mc-Graw Hill, Delhi. (2014).
7. Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India (2015)..
8. Tall Building Structures on Elastic Subgrade and Research of Semi-Analytical method by Gong Yaoqing. Beijing: Tsinghua University

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1. Tall Chimneys, Manohar S. N., Tata McGraw Hill Publishing Company, New Delhi
2. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., South Asian Publishers, New Delhi.
3. Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons, 2010. 4. IS Codes: IS:456, IS:875, IS:1893, IS:4326, IS:13920, IS: 3370, IS: 4995 (I & II), SP:16,SP:34.

WEBSITE REFERENCES:

1. Design of Tall Structure NPTEL course: http://nptel.ac.in/
2. Vertical Sync Details (brainkart.com)
3. Types of High-Rise Buildings Structural Systems - The Constructor
4. Approximate Structural Analysis - Civil Engineering Knowledge Base (civilax.com)
5. Structural and load component of high rise buildings (constrofacilitator.com)

Mapping of PO with CO

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

Mapping of PSO with CO

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	2
CO5	1	2
AVG	1	1

JCE1024	REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge on various repair strategies.
- To learn various strength and durability properties of concrete.
- To impart knowledge on special concrete.
- To apply different construction techniques for repair and protection methods.
- To introduce retrofitting of structures.

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 damaged structure, Distresses monitoring, causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9

Quality assurance for concrete–Strength, Durability- Various cracks in R.C. buildings, causes and effects – Various methods of crack repair. Repair to active cracks, Repair to dormant cracks- Effects due to climate, temperature, Sustained elevated temperature, Corrosion

UNIT III SPECIAL CONCRETES 9

Polymer concrete, Sulphur infiltrated concrete, Fiber reinforced composites, 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, Load Test for Stability-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

Repair materials, Strengthening of Structural elements- Seismic strengthening of existing RC structures- Repair of structures distressed due to corrosion, fire, leakage, earthquake- Transportation of Structures from one place to other –Structural Health Monitoring- demolition techniques-Engineered demolition methods-Case studies

TOTAL : 45 PERIODS

COURSE OUTCOMES:

- Describe the importance of maintenance and assessment method of distressed structures
- Illustrate the strength and durability properties ,their effects due to climate and temperature
- Review the recent development in concrete.
- Apply the techniques for repair rand protection methods
- Identify repair, rehabilitation and retrofitting of structures and demolition methods

TEXT BOOKS:

1. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009.
2. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
3. Dodge Woodson.R Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann,Elsevier,New Delhi 2012

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1. Shetty.M.S.ConcreteTechnology-Theory and Practice,S.Chandand Company, 2018.
2.DovKominetzky.M.S.,-Design and Construction Failures, Galgotia, Publications Pvt.Ltd.,2011
3. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2014.
4. Hand book onSeismic Retrofit of Buildings,CPWD and Indian Buildings Congress, Narosa Publishers, 2018.
5. Hand Book on “Repair and Rehabilitation of RCC Buildings”–Director General works CPWD,Govt of India , New Delhi–200

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2. https://ocw.mit.edu/courses/1-054-mechanics-and-design-of-concrete-structures-spring-2004/
3. 3.https://cbri.res.in/wp-content/uploads/2017/09/Good-Contruction-Practice-book-CBRI-2017.pdf
4. 4.http://www.nptel.iitm.ac.in/courses/nd1_noc20_ce26
5.https://theconstructor.org/wp-content/uploads/2016/09/handbook-rrs.pdf

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	3
CO5	-	3
AVG	-	3

JCE1055	PREFABRICATED STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To introduce the basic concepts of prefabrication
- To acquire the knowledge of prefabrication components and systems
- To understand the design principles in prefabrication
- To perceive the types of joints and connections in structural members
- To impart knowledge about the structural stability.

UNIT I INTRODUCTION 9

Need for prefabrication -Advantages and limitations – Principles of prefabrication – Modular coordination– Standarization– Loads and load combinations–Materials–Production– Transportation – Erection

UNIT II PREFABRICATED COMPONENTS AND SYSTEMS 9

Behaviour and types of structural components– roof and floor slabs – Walls panels - Shear walls - Beams - Columns – skeletal system- portal frame system-Large panel systems- block system

UNIT III DESIGN PRINCIPLES 9

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems- Design for stripping , stacking ,transportation and erection of elements

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS 9

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction joints , contraction joints, expansion joints. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse -case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Students will be able to
CO1 Understand concepts about principles of prefabrication, production, transportation, erection.
CO2 Acquire knowledge about panel systems, slabs, beams, shear walls and columns used in precast construction.

CO3 Acquire knowledge about design of cross section, joint flexibility.
CO4 Acquire knowledge about joints and connection in precast construction.
CO5 Acquire knowledge about structural stability.

TEXTBOOKS:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA,1991.

2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage ,CRC Press, 2019

3. Alfred Steinle, Hubert Bachmann, Mathias Tillmann, Philip Thrift . "Precast Concrete Structures", Ernst & Sohn, Berlin, 2019

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1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.

2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.

3. " Precast concrete connection details", Structural Design manual, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
AVG	3	2

JCE1054	FINITE ELEMENT METHOD	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To understand the basics of finite element formulation.
- To formulate the stiffness matrix for beam, truss and framed structures.
- To apply finite element formulations to solve one-dimensional problems.
- To apply finite element method to solve two dimensional problems.
- To apply finite element method to analyze plate bending problems

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UNIT I INTRODUCTION 9

Historical Background – Mathematical Modeling of field problems in Engineering –Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT II STIFFNESS MATRIX FORMULATION 9

Introduction to Discrete and Continua elements – Discrete Elements - Direct stiffness method - Special characteristics of stiffness matrix - Assemblage of elements – Boundary condition & reaction- 2D – truss element - 2D - beam element - Analysis of framed Structures - Basic steps in finite element analysis - Differential equilibrium equations - strain displacement relation - linear constitutive relation - Numerical methods in finite element analysis- Gauss elimination method.

UNIT III ONE DIMENSIONAL PROBLEMS 9

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Continua Elements - Displacement models - convergence requirements. Natural coordinate systems - Shape function. Interpolation function. Linear and quadratic elements - Lagrange & Serendipity elements. Strain displacement matrix - element stiffness matrix and nodal load vector. Natural frequencies of longitudinal vibration and mode shapes.

UNIT IV TWO DIMENSIONAL PROBLEMS 9

Two dimensional isoparametric elements - Four noded quadrilateral elements - triangular elements. Computation of stiffness matrix for isoparametric elements - numerical integration (Gauss quadrature) Convergence criteria for isoparametric elements.

UNIT V ANALYSIS OF PLATES 9

Introduction to Plate Bending Problems - displacement functions – Analysis of Thin Plate - Analysis of Thick Plate - Analysis of Skew Plate, Finite Element Analysis of Shell, plane stress and plane strain analysis, Example problem using any general-purpose finite element software

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Understand the basics of finite element formulation.
- Formulate the stiffness matrix for beam, truss and framed structures.
- Solve one-dimensional problems using finite element formulations
- Solve two dimensional problems using finite element method
- Analyze plate bending problems using finite element method

TEXT BOOKS:

1. Rao, S.S., "The Finite Element Method in Engineering", 6th Edition, ButterworthHeinemann,2018.
2. Reddy,J.N. "Introduction to the Finite Element Method", 4thEdition, Tata McGrawHill,2018.

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1. Krishnamoorthy, C. S, Finite Element Analysis - Theory and Programming, McGraw - Hill, 1995.
2. David Hutton, Fundamentals of Finite Element Analysis, Tata McGraw Hill Publishing Company Limited, New Delhi, 2005.
3. G.R. Liu and S.S.Quek, Finite Element Method: A Practical Course, Butterworth-Heinemann; 1st edition (21 February 2003)
4. Chennakesava R. Alavala Finite Element Methods: Basic Concepts and Applications, Prentice Hall Inc., 2010.
5. R. T. Chandrupatla and A. D. Belegundu, Introduction to Finite Elements in Engineering, PHI Learning Pvt Ltd, New Delhi, 1997.
6. S. S. Bhavikatti, Finite Element Analysis, New Age Publishers, 2007.

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
AVG	3	2

JCE1056	ENERGY EFFICIENT BUILDINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To provide an understanding of the concept of energy consumption in buildings
- To study the passive solar heating and cooling
- To study the day-lighting and electrical lighting in a building
- To design the building ventilation and heat control for indoor comfort
- To design a building for climatic zone

UNIT I INTRODUCTION 9

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT II PASSIVE SOLAR HEATING AND COOLING 9

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools- Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING 9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts –Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.

UNIT IV HEAT CONTROL AND VENTILATION 9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed.

UNIT V DESIGN FOR CLIMATIC ZONES 9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On completion of this course, the student is expected to be able to

- Explain environmental energy supplies on buildings
- Explain the passives on air heating, cooling system
- Discuss the various aspects of day-lighting and electrical lighting in a building
- Predict and design building ventilation and heat control for indoor comfort
- Design a building for climatic zone and apply simulation programs of buildings to perform energy calculations

REFERENCES

1. Energy Conservation Building Code, cau of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995
3. Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.
4. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc,3rd Edition, 2014
5. Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-ConventionalEnergySources,2009

CO-PO MAPPINGS

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

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	3
CO5	2	3
AVG	3	3

JCE1020	PRESTRESSED CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To understand the methods and types of prestressing
- To design for flexure and shear of beams
- To understand deflection and design of anchorage zone
- To design of continuous and composite beams
- To design water tanks,pipes,poles and sleepers

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Losses of prestress in post -tensioned and pre-tensioned members.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of 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 DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short-term deflections of uncracked members – Prediction of long-term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and I.S. 1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre- tensioned beams– 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 – Shrinkage strain and its importance – Differential shrinkage - Methods of achieving continuity in continuous beams – Analysis for secondary moments - Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELANEOUS STRUCTURES 9

Role of prestressing in members subjected to Tensile forces and compressive forces – Design of Tension members and Compression members - Design of Tanks, Pipes, Sleepers and Poles – Partial prestressing – methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Students will be able to

CO1 Design a prestressed concrete beam accounting for losses.
CO2 Design for flexure and shear.
CO3 Design the anchorage zone for post-tensioned members and estimate the deflection in beams.
CO4 Design composite members and continuous beams.
CO5 Design water tanks, pipes, poles and sleepers.

TEXTBOOKS:

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, 2014

REFERENCES:

1. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
2. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2017.
3. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2017
4. Sinha.N.C. And Roy.S.K. Fundamentals of Prestressed Concrete, S.Chand and Co. Ltd., 2011

CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO4	2	2	3	1	1	1	1	2	1	1	1	2
CO5	2	2	3	1	1	1	1	2	1	1	1	2
AVG	3	2	3	1	1	1	1	2	1	1	1	2

CO-PSO MAPPINGS

CO\PSO	PSO1	PSO2
CO1	3	1
CO2	3	3
CO3	3	3
CO4	3	2
CO5	3	3
AVG	3	1

OPEN ELECTIVE - 1
SEMESTER – IV

		L	T	P	C
JCE9001	**GEOGRAPHIC INFORMATION SYSTEM**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To introduce the basics and components of Geographic Information System.
- To understand the concept of spatial data structures.
- To get exposure to the details of input management and output processes.
- To impart knowledge on data quality standards and management.
- To gain knowledge on application of GIS

UNIT I BASICS OF GIS **9**

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems - Definitions - History of GIS - Components of a GIS - Hardware, Software, Data, People, Methods –Proprietary and open source Software - Types of data - Spatial, Attribute data- types of attributes - scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS **9**

Database Structures - Relational, Object Oriented - Entities - ER diagram - data models - conceptual, logical and physical models - spatial data models - Raster Data Structures - Raster Data Compression Vector Data Structures - Raster vs. Vector Models - TIN and GRID data models.

UNIT III DATA INPUT AND TOPOLOGY **9**

Scanner - Raster Data Input - Raster Data File Formats - Georeferencing - Vector Data Input - Digitiser - Datum Projection and reprojection - Coordinate Transformation - Topology - Adjacency, connectivity and containment - Topological Consistency GIS functions - Overlay operations - Non topological file formats - Attribute Data linking - Linking External Databases - GPS Data Integration.

UNIT IV DATA QUALITY STANDARDS AND MANAGEMENT **9**

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage - Metadata - GIS Standards - Interoperability - OGC - Spatial Data Infrastructure - Import/Export - Data Management functions - Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation - Chart/Graphs - Multimedia - Enterprise vs. Desktop GIS distributed GIS.

UNIT V APPLICATION OF GIS **9**

Application of GIS in Monitoring and management of environment - surface water and groundwater Conservation of resources -Forest Fire Management -Sustainable land use - Coastal zone management – Limitations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Describe the fundamentals of GIS and software requirements.
CO2: Familiarize the raster and vector data models.
CO3: Insight knowledge on data input and topology.
CO4: Enumerate the aspects of data quality and standards.
CO5: Enrich knowledge on various applications of GIS.

TEXT BOOKS:

1. Kang-tsung Chang, "Introduction to Geographic Information Systems" 9th Edition,McGraw- Hill Education, 2018.
2. Ian, H, Sarah, C, Steve, C, "An Introduction to Geographical Information Systems",Pearson Education, 4th Edition, 2012.
3. Chandra, A.M, Ghosh, S.K, "Remote Sensing and GIS", Narosa Pub, 2007.

REFERENCES:

1. Chor, P. Lo, Albert, K. W. Yeung, "Concepts and Techniques of Geographic Information Systems", Pearson, 2016.
2. Michael, N. DeMers, "Fundamentals of geographic information systems", Wiley, 2009.
3. Jatin Pandey "Geographic Information System", The Energy and Resources Institute(TERI), 2014.
4. Suchandra, C, "An Introduction to Geographic Information Technology", I. K.International Pvt. Ltd, 2013.
5. Peter, A. Burrough,Rachael McDonnell, Rachael, A. McDonnell,Christopher, D. Lloyd,"Principles of Geographical Information Systems", OUP Oxford, 2015.

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3. https://nptel.ac.in/courses/105/107/105107155/
4. https://gisgeography.com/
5. https://tngis.tn.gov.in/

CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO4	3	3	3	3	-	3	3	1	3	2	3	3
CO5	3	3	3	3	-	3	3	1	3	2	3	3
AVG	3	3	3	3	-	3	3	1	3	2	3	3

JCE9002	WATER CONSERVATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the emerging issues in water management.
- To impart knowledge on importance of urban storm water management.
- To learn the roles of both men and women in water management.
- To familiarize with water conservation and reuse.
- To gain knowledge on water management practices.

UNIT I EMERGING ISSUES IN WATER MANAGEMENT 9

Global and National Perspectives of Water Crisis - Water Functions in Life Support System - Water Availability and Requirements for Humans and Nature - Concept of 'Blue Water', 'Green Water','GreyWater' and Virtual Water Trade - Drinking water management in the context of climate change Flood-Drought - Pollution - Linkages between water, health and poverty.

UNIT II URBAN STORM WATER MANAGEMENT 9

Water supply system- water demand - Uncertainty and reliability - Urban hydrological cycle - Human induced changes in urban watershed - Storm water management regulations - structural storm management systems - Newer trends in storm water management (Green infrastructure).

UNIT III GENDER AND WATER RESOURCES MANAGEMENT 8

Gender Approach to Water Management - Drinking and Domestic Water - Sanitation and Hygiene - Gender and Food Security - Gender and Capacity Building - Mainstreaming gender in Water Management - Gender Policies in Water Management - Country Experiences.

UNIT IV PARTICIPATORY WATER CONSERVATION AND REUSE 10

Global Challenges -Social - Economic - Environmental - Solutions - Political - Water Marketing - Water Rights - Water conservation measures - Trends in supply and demand - indoor conservation - outdoor conservation - Rainwater harvesting - Low Energy Approaches to Water Management - Management of sullage water and sewage - public education - Success Stories Case Studies.

UNIT V WATER GOVERNANCE AND GOOD PRACTICES 9

Challenges in water sector - Institutional setting, Supply Management - Demand Management- Wastewater management - Private sector participation, urban service delivery - customer satisfaction - financial resource management - case studies of best practices in cities across the world.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Acquire knowledge on the global and regional issues in water resources management.
CO2: Demonstrate the techniques of urban storm water management.
CO3: Comprehend the roles of men and women in water management.
CO4: Describe the concept of participatory water conservation and reuse of water.
CO5: Identify the best management practices for Indian context.

TEXT BOOKS:

1. Cole, G, "Water Conservation and Management", Larsen and Keller Education, 2017.
2. Chatterjee, S.N, "Water Resources, Conservation and Management", Atlantic Publishers& Dist., 2008.
3. Veeriah, J, Ashantha, G, John, V. Leeuwen, Jaya, K, Doug, W, Baden, M,Muhammed, B, Kevin, S, Geoffrey, P, "Urban Storm water and Flood Management",Springer, 2019.

REFERENCES:

1. James, C.Y.Guo, "Urban Flood Mitigation and Stormwater Management", CRC Press, 2017.
2. Madireddi, V.Subba Rao, "Water Conservation, Management and Analysis",Read worthy, 2011.
3. Walter, L. Filho, Vakur, S, "Sustainable Water Use and Management" Springer, 2014.
4. Bansil, P.C, "Water Management in India", Concept Publishing Company, 2004.
5. Amy, V, "Handbook of Water Use and Conservation", Waterplow Press, 2001.

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2. https://www.indiawaterportal.org/articles/trading-virtual-water
3. https://waterfootprint.org/en/water-footprint/national-water-footprint/virtual-water-trade/
4. https://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/water-governance/resource-guide-mainstreaming-gender-in-water-management/IWRMGenderResourceGuide-English-200610.pdf
5. http://www.iwmi.cgiar.org/iwmi-tata/PDFs/iwmi-tata_water_policy_discussion_paper_issue_01_2018.pdf

CO-PO MAPPINGS

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

		L	T	P	C
JCE9003	**WASTE MANAGEMENT**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To introduce various types of solid waste produced with their characteristics.
- To understand different methods of collection, transportation and disposal of solid waste.
- To familiarize different method of disposal of solid waste for safe disposal.
- To enhance knowledge on E-waste and Industrial waste.
- To impart knowledge on Bio medical waste handling and management.

UNIT I SOURCES, CHARECTERISTICS AND MANAGEMENT OF SOLID WASTE 9

Definition of solid waste - Sources of solid waste - Classification of solid waste - Physical and Chemical characteristics. - Impact of solid waste on environment. - Solid waste management techniques - solid waste management Hierarchy, waste prevention and waste reduction - Factors affecting on solid waste generation.

UNIT II STORAGE, COLLECTION AND TRANSPORTATION OF MUNICIPAL SOLID WASTE 9

Storage of municipal waste - Collection methods of municipal waste- Tools and Equipments - Litter Bin, Broom, Shovels, Mechanical road sweepers, Community Bin like movable and stationary Bin- Transportation of municipal waste- Transportation vehicles with their capacity and Trucks, Dumper, Compactor vehicles. Transfer station- meaning, necessity, location.

UNIT III DISPOSAL OF SOLID WASTE 9

Land filling methods- Composting method – Vermi composting -Incineration of waste - Types of incinerators-Multiple chamber incinerators and Municipal incinerators - Pyrolysis of waste – Definition, methods, Advantages and Disadvantages of incineration process

UNIT IV E WASTE AND INDUSTRIAL WASTE MANAGEMENT 9

E-waste - Definition and Varieties of E- waste - Dangers of E- waste - Disposal of E- waste - Recycling of E- waste. Industrial waste - Variety of industrial waste - Collection of disposal of industrial waste -Control measures of industrial waste- Recycling of industrial waste.

UNIT V BIOMEDICAL WASTE MANAGEMENT AND HEALTH ASPECTS 9

Biomedical Waste - Definition of Biomedical Waste - Sources and generation of Biomedical Waste - Classification of Biomedical Waste - Management technologies - Health aspect during handling and processing.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

CO1: Illustrate the necessity of solid waste management.
CO2: Demonstrate the storage, collection and transport of solid waste.
CO3: Identify the relevant method for solid waste disposal.
CO4: Apply suitable method for the disposal of E waste.
CO5: Explain the handling and ill effects of biomedical waste

TEXT BOOKS:

1. Tchobanoglous G, Theissen H, Eliassen R, "Solid Waste Engineering - Principles and Management Issues", McGraw Hill, New York. 1991.
2. Majeti, N.V. Prasad, Meththika, V, Anwesha, B, Butterworth-Heinemann, "Handbook of Electronic Waste Management: International Best Practices and Case Studies", Science , 2019.
3. Sushma, S, "Bio-Medical Waste Management", APH Publishing Corporation, 2009.

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1. Peavy, R, Tchobanoglous, "Environmental Engineering", McGraw Hill Co. 4th Edition.1985.
2. CPHEEO, Manual on Municipal Solid waste management, Central Public Health andEnvironmental Engineering Organization, Government of India, New Delhi, 2000.
3. Rao, M.N, Razia, S, Sri H.Kota, Anil, S, Naresh, D, Butterworth-Heinemann, "Solid and Hazardous Waste Management: Science and Engineering", 2016.
4. Ronald, E. Hester, Roy, M. Harrison, "Electronic Waste Management", Royal Society of Chemistry, 2009.
5. Bernd Bilitewski, Georg Härdtle, Klaus Marek, "Waste Management", Springer Science & Business Media, 2013.

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2. www.almitrapatel.com
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4. www.epa.gov/epaoswer/non-hw/muncipal/index.htm
5. http://www.seattle.gov/util/MyServices/Garbage/index.htm

CO-PO MAPPINGS

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

OPEN ELECTIVE - 2
SEMESTER – V

JCE9004	AIR POLLUTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the major sources of air pollution.
- To study the meteorology of air.
- To acquire knowledge on the control techniques and its collectors.
- To gain knowledge on gaseous pollution control.
- To grasp knowledge on pollution due to automobiles.

UNIT I SOURCES OF AIR POLLUTANTS 9

Definition of clean air- Sources-Classification of air pollutants -Effects of air pollution on man ,animals, Vegetation and materials -Ambient Air Quality Standards- Types of inversion -Photochemical smog - Air pollution control legislation.

UNIT II METEOROLOGY 9

Meteorology and Air pollution –Temperature lapse rate- Atmospheric stability- wind velocity & turbulence– Inversions – Mixing height –Plume behavior – Plume rise estimation – Effluent dispersion theories.

UNIT III CONTROL TECHNIQUES 9

Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multipletype cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers-Cyclone separators- Filters & ESP.

UNIT IV GASEOUS POLLUTION CONTROL 9

Gaseous pollution control –Sampling of particulate and gaseous pollutants-Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3) Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers Incineration –Equipment description.

UNIT V AIR POLLUTION DUE TO AUTOMOBILES 9

Air pollution due to automobiles, standards and control methods – automotive emission - classification of gasoline emissions – photochemical smog - Environmental issues, global episodes, laws, acts, protocols.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Identify the various sources of air pollutants.
- Demonstrate the meteorology of air and plume behaviour.
- Identify the different types of air pollutants and their control techniques.
- Apply the effective strategies to prevent gaseous pollution control.
- Illustrate the reduction on pollution due to automobiles.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering",Tokyo, 2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Mc Graw Hill, New York, 1995.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

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3. Wayne T.Davis, "Air Pollution Engineering Manual" , John Wiley & Sons, Inc.,2000.
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3. https://nptel.ac.in/courses/103/107/103107084/
4. https://tnpcb.gov.in/air-quality.php
5. https://aqicn.org/map/india/

CO-PO MAPPING

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

JCE9005	GLOBAL CLIMATE CHANGE AND ITS IMPACT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic terminology related to weather and climate.
- To gain knowledge on various elements and processes related to climate change.
- To study the climate change mitigation measures.
- To acquire knowledge on climate change adaptation strategies.
- To learn the climate change extreme events and sustainable restoration.

UNIT I INTRODUCTION TO WEATHER AND CLIMATE 9

Atmosphere – Climatology and Paleo climatology, Factors affecting global, regional and local climates, weather parameters. Tropical climate, Monsoons, Polar, Desert, Mid-latitude climates and their role in global climate change.

UNIT II ELEMENTS AND PROCESSES RELATED TO CLIMATE CHANGE 9

Structure and driving forces of the earth - Global energy balance. Earth's carbon reservoirs- marine and terrestrial, Carbon cycles, Global Ocean Circulation, Southern oscillation (El-Nino and La-Nina), Greenhouse gases and global warming - Industrialization and urbanization, Representative Concentration Pathways.

UNIT III CLIMATE CHANGE MITIGATION 9

Global and India emission status, Nationally Determined Contribution (NDC), International agreement sand protocols, Future use of renewable energy, Carbon Capture and Carbon Sequestration.

UNIT IV CLIMATE CHANGE ADAPTATION 9

Impacts and Vulnerability on Water, Agriculture, Forestry, Coastal and Health. Traditional knowledge to cope with climate change impacts – Community and ecological based adaptation, Climate Adaptation Fund and Insurance.

UNIT V CONSERVATION OF NATURAL RESOURCES 9

Climate Change and Sustainable development, Water and Food Security, Need for Conservation of Natural Resources (Forestry and Coastal Eco-system), Climate Extreme events – heat wave, flood and droughts, Sea Level Rise and Ocean acidification and Natural based solution for conservation

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Define the basic terminologies related to weather and climate.
- Demonstrate the natural and anthropogenic activities that accelerate the climate change.
- Describe the various protocols and agreement to reduce climate change impacts.
- Apply the adaptive techniques to build the climate resilience society.
- Summarize the stress on natural resources and conserve it from natural calamities.

TEXT BOOKS:

1. John, M. Wallace, Peter, V. Hobbs, "Atmospheric Science: An Introductory Survey", Second Edition, Academic Press an imprint of Elsevier, 2006.
2. Sangam, S. Mukand, S. Babel and Vishnu, P Pandey, "Climate Change and Water Resources",CRC Press an imprint of the Taylor & Francis Group, 2014.
3. Dash, S. Kumar, "Climate Change - An Indian Perspective", Cambridge University Press India Pvt.Ltd, 2007.

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2. Jan, C. van Dam, "Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press, 2003.
3. Dan Gafta and John Akeroyd, Nature Conservation Concepts and Practice, Springer, 2006
4. W. Neil Adger, Irene Lorenzoni and Karen L. O, Adapting to Climate Change:Thresholds, Values, Governance, Cambridge, 2009.
5. Vineet Kumar, Arjuna Srinidhi, Chandra Bhushan, Geetika Singh, Rising to the Call: Good Practices of Climate Change Adaptation in India, Centre For Science And Environment publisher, 2014

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2. http://moef.gov.in/division/environment-divisions/climate-changecc-2/documents-publications/
3. https://climate.nasa.gov/
4. https://unfccc.int/
5. https://www.adaptationcommunity.net/?wpfb_dl=236

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO12
CO1	2	-	-	-	-	1	1	1	-	-	-	1
CO2	1	-	-	-	-	1	1	1	-	-	-	3
CO3	2	-	-	-	-	2	2	1	-	-	-	3
CO4	2	-	-	-	-	2	2	1	-	-	-	3
CO5	1	-	-	-	-	2	2	1	-	-	-	3
AVG	2	-	-	-	-	2	2	1	-	-	-	3

JCE9005	SUSTAINABLE URBAN PLANNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the planning of urban development project and financing.
- To learn the urban renewal programmes.
- To gain adequate knowledge on planning and regulation of housing projects.
- To acquire knowledge on sustainable development and transport.
- To study the management of urban system.

UNIT I PLANNING OF URBAN DEVELOPMENT PROJECT 9

Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

UNIT II URBAN RENEWAL PROGRAMMES 9

Urban renewal as a part of metropolitan plan - Techniques of identification of urban renewal areas - Conservation, Rehabilitation and Redevelopment - Management of urban renewal areas - Incentive zoning and Transfer of Development Rights.

UNIT III PLAN IMPLEMENTATION AND REGULATION 9

Planning Acts and authorities – Statutory approval process – DDP rules – Land use zones and sub classification – Permissible activity and appellant activities – Unauthorized developments.

UNIT IV SUSTAINABLE URBAN MOBILITY 9

Need for sustainable development and transport – Non-motorized transport – Transit Oriented Development – Innovative transport developments and its implication on urban development and mobility.

UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM 9

Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standard sand Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Demonstrate the planning and designing of urban development project.
- Identify the urban renewal programs.
- Explain the importance of plan implementation and regulations.
- Discuss the effective sustainable urban mobility.
- Describe the role of public, private and non-government organizations in sustainable urban planning.

TEXTBOOKS:

1. Goel, S.L "Urban Development and Management", Deep and Deep publications, New Delhi2002.
2. George Chadwick, "A Systems view of planning", Pergamon press, Oxford 1978.
3. Singh V.B, "Revitalised Urban Administration in India", Kalpaz publication, Delhi, 2001.

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1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya PublishingHouse, Bombay, 1997.
3. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
4. Edwin S. Mills and Charles M. Becker, Studies in Urban development, A World Bankpublication, 1986.
5. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt.Ltd.,New Delhi, 1999.

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3. https://nptel.ac.in/courses/124/107/124107007/
4. https://nptel.ac.in/courses/124/105/124105016/
5. https://ocw.mit.edu/courses/urban-studies-and-planning/

CO-PO MAPPING

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

OPEN ELECTIVE 3
SEMESTER VI

JCE9007	SMART BUILDING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the concept of building automation system.
- To study the components of building automation system.
- To acquire knowledge on energy management in buildings.
- To enhance knowledge on technology in intelligent buildings.
- To learn the essentials in smart buildings.

UNIT I INTRODUCTION TO BUILDING AUTOMATION SYSTEM 9

History of Building Automation in Building Types and Key Requirements - Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system.

UNIT II COMPONENTS AND EQUIPMENT OF BUILDING AUTOMATION SYSTEM 9

Components - Equipment controlled by BMS in buildings - Heating, Ventilation, and Air-conditioning - Lighting control system -Fire alarm system - Pumping system - Water tanks level - Irrigation system -Water Leak detection system.

UNIT III ENERGY MANAGEMENT IN BUILDING 9

Energy in building design - Energy efficient and environment friendly building – Thermal phenomena -thermal comfort - Indoor Air quality - passive heating and cooling systems - Identification of wastage -Priority of conservative measures - Maintenance of management programme.

UNIT IV INTELLIGENT BUILDING 9

Definition of Intelligent Building – Evolution of Intelligent Building - Features and benefits of intelligent buildings - Intelligent architecture and structure – Facility management.

UNIT V SMART BUILDING 9

Essential attributes of Smart Building - Zero Energy Building – Green Building – Smart Windows – Light and Solar control glazing and system – Energy Generating Glazing – case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course the students will be able to;

- Explain the concept in building automation.
- Demonstrate the concepts and equipments in building automation system.
- Apply the energy management technology in building.
- Summarize the concept of intelligent building.
- Describe the essentials of smart building.

TEXT BOOKS

1. Shengwei Wang, "Intelligent Buildings and Building Automation", Spon Press, 2010.
2. Wang, Shengwei "Intelligent Buildings and Building Automation", CRC Press, 2009.
3. Casini, Marco. "Smart Buildings: Advanced Materials and Nanotechnology to Improve Energy-Efficiency and Environmental Performance", Elsevier Science, 2016.

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1. Jim Sinopoli, Smart Building Systems for Architectures, Owners and Builders, Elsevier, 2010.
2. Derek Clements-Croome "Intelligent Buildings: An Introduction" United Kingdom,CRC Press, 2013.
3. Advancements in Smart City and Intelligent Building: Proceedings of the International Conference on Smart City and Intelligent Building (ICSCIB 2018). Germany, Springer Singapore, 2019.
4. Anand Nayyar, Arun Solanki "Green Building Management and Smart Automation" United States, IGI Global, 2019.
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3. https://www.greenestbuilding.com/smart-building/
4. https://www.mdpi.com/2075-5309/10/9/153/pdf
5. https://cdn2.hubspot.net/hubfs/2679969/Case%20Studies/MBRDI%20Case%20Study.pdf

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO12
CO1	1	-	-	-	1	1	2	-	-	-	-	2
CO2	1	-	-	-	1	1	2	-	-	-	-	2
CO3	1	-	-	-	1	1	2	-	-	-	-	2
CO4	1	-	-	-	1	1	2	-	-	-	-	2
CO5	1	-	-	-	1	1	2	-	-	-	-	2
AVG	1	-	-	-	1	1	2	-	-	-	-	2

JCE9008	RENEWABLE ENERGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the principles of solar radiation and its environmental impact.
- To acquire knowledge on the various collectors used for storing solar energy.
- To study the various applications in solar energy.
- To impart knowledge on implementation of wind and biomass energy.
- To learn the various types of geothermal energy.

UNIT I PRINCIPLES OF SOLAR RADIATION 9

Role and potential of new and renewable source - Domestic energy consumption –savings- challenges -the solar energy option - Environmental impact of solar power - Solar constant - extraterrestrial and terrestrial solar radiation - solar radiation on titled surface - Instruments for measuring solar radiation and sun shine - solar radiation data.

UNIT II SOLAR ENERGY COLLECTION 9

Solar Energy and Conservation –Types of collectors - Flat plate and concentrating collectors, classification of concentrating collectors - orientation and thermal analysis - advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND ITS APPLICATIONS 9

Primary energy use in buildings –Residential -Commercial -Institutional –Public Buildings -Different methods – Sensible - Latent heat and stratified storage, solar ponds- Solar Applications solar heating/cooling technique -Solar distillation and drying- Photovoltaic energy conversion.

UNIT IV IMPLEMENTATION OF WIND ENERGY AND BIO ENERGY 9

Sources and potentials - Horizontal and vertical axis windmills- Performance characteristics -Betz criteria Bio-Mass: Principles of Bio-Conversion -Anaerobic/aerobic digestion -Types of Bio-gas digesters- Gas yield -Combustion characteristics of bio-gas-utilization for cooking, I.C.Engine operation and economic aspects-Priority of conservative measures -Maintenance.

UNIT V GEOTHERMAL ENERGY 9

Requirements for resources - Direct Energy Conversion-Need for DEC - Principles of DEC -Carnot cycle- Limitations-OTEC -Principles utilization- Setting of OTEC plants- Thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques-mini-hydel power plants and their economics**.**

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- Explain the framework of solar power and solar radiation.
- Demonstrate the various types of solar energy collectors.
- Summarize the solar energy storage systems and their applications.
- Explain the wind energy and the utilization biomass with economic aspects.
- Describe the various forms of geothermal energies.

TEXT BOOKS:

1. Rai G.D. , "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell&Wier, "Renewable Energy Resources", CRC Press (Taylor & Francis), 2011.
3. Roland Wengenmayr, Thomas Bührke, "Renewable Energy Sustainable Energy Concepts forthe Energy Change" Wiley,2013.

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2. Ramesh R & Kumar K.U , "Renewable Energy Technologies",Narosa Publishing House, 2004.
3. Mittal K M, "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi,2003.
4. Kothari D.P, Singhal ., K.C., "Renewable energy sources and emerging technologies", P.H.I,New Delhi, 2010.
5. Mehmet Kanoglu,Yunus A. Cengel,John M. Cimbala, "Fundamentals and Applications of Renewable Energy"McGraw-Hill Education,2019.

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5. https://ocw.mit.edu/courses/nuclear-engineering/22-081j-introduction-to-sustainable-energy-fall-2010/
6. https://mnre.gov.in/

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO12
CO1	1	-	-	-	1	1	2	-	-	-	-	2
CO2	1	-	-	-	1	1	2	-	-	-	-	2
CO3	1	-	-	-	1	1	2	-	-	-	-	2
CO4	1	-	-	-	1	1	2	-	-	-	-	2
CO5	1	-	-	-	1	1	2	-	-	-	-	2
AVG	1	-	-	-	1	1	2	-	-	-	-	2

JCE9009	GREEN BUILDINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basics of green buildings.
- To gain knowledge on green building materials and its resources.
- To learn the thermal comfort in buildings.
- To study the concept of energy efficient technologies and its appliances.
- To acquire knowledge on the green composite buildings.

UNIT I INTRODUCTION OF GREEN BUILDINGS 9

Introduction of green building - Need of green building in present scenario - Importance of green building Merits and demerits, Classification of green building -Assessment methods Global assessment and certification - Local assessment, LEED India GRIHA (Green Rating for Integrated Habitat Assessment)

UNIT II GREEN BUILDING CONCEPTS AND PRACTICES 9

Green Building Concepts and Practices Indian Green Building Council - Green Building Moment in India - Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building - Green Building Features, Material and Resources

UNIT III COMFORTS IN BUILDINGS 9

Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations

UNIT IV ENERGY EFFICIENCY 9

Environmental impact of building constructions - Concepts of embodied energy, operational energy and life cycle energy.-Methods to reduce operational energy: Energy efficient building envelopes - efficient lighting technologies - energy efficient appliances for heating and air-conditioning systems in buildings - zero ozone depleting potential (ODP) materials - wind and solar energy harvesting - energy metering and monitoring - concept of net zero buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to;

- technologies to improve energy efficiency in green buildings
- Describe the Explain the various types of green buildings.
- Describe the general principles and concepts of green buildings.
- Summarize the thermal comfort of a buildings.
- Demonstrate the application of green composites in building.

TEXT BOOKS:

1. Gajanan M. Sabnis, "Green Building with Concrete Sustainable Design and Construction",Second Edition, CRC Press,2015.
2. Sam Kubba, "Handbook of Green Building Design and Construction", Elsevier Science 2015.
3. Jagadish, Venkatarama Reddy and Nanjunda Rao, "Alternative building materials andtechnologies" New Age International (P) Limited, 2014.

REFERENCES:

1. Handbook on Green Practices published by Indian Society of Heating Refrigeratingand Air conditioning Engineers, 2009.
2. Seville, Carl, and Kruger, Abe "Green Building: Principles and Practices in Residential Construction", Cengage Learning, 2012.
3. Mike Montoya, "Green Building Fundamentals", Pearson, USA, 2010.
4. Anand Nayyar, Arun Solanki "Green Building Management and SmartAutomation", IGI Global, 2019.
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3. https://www.edx.org/course/environmental-technologies-in-buildings
4. https://greenbuildingcanada.ca/green-building-guide/what-is-green-building/
5. https://www.greenbiz.com/sites/default/files/document/O16F22028.pdf
6. https://www.greenspec.co.uk/building-design/

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO12
CO1	1	-	-	-	1	1	2	-	-	-	-	2
CO2	1	-	-	-	1	1	2	-	-	-	-	2
CO3	1	-	-	-	1	1	2	-	-	-	-	2
CO4	1	-	-	-	1	1	2	-	-	-	-	2
CO5	1	-	-	-	1	1	2	-	-	-	-	2
AVG	1	-	-	-	1	1	2	-	-	-	-	2

OPEN ELECTIVE- IV

SEMESTER-VII

JCE 9010	TESTING OF MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the Classification of material testing
- To learn the other testing involved in various applications
- To learn the non destructive testing.
- To discuss about mechanical testing.
- To learn about material characteristics using various testing.

UNIT-I INTRODUCTION TO MATERIALS TESTING **9**

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing**.**

UNIT II OTHERS TESTING **9**

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermome chemical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

UNIT III NON DESTRUCTIVE TESTING **9**

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Rebound hammer- Acoustic emission- Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MECHANICAL TESTING **9**

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell),Hardness number-Tensile test, Impact test (Izod, Charpy) – Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test – Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT V MATERIAL CHARACTERIZATION TESTING **9**

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, XRD,EDAX-Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Identify the different types of material testing
- Evaluate the other testing involved in various applications
- Describe about NDT.
- Describe the methods of mechanical testing.
- Categorize Macroscopic and Microscopic observations using various testing.

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu Practical Non-Destructive Testing, Narosa Publishing House, 2019.
2. Cullity, B. D., Elements of X-ray diffraction, 3rd Edition, Addison-Wesley Company Inc., New York, 2012.
3. P. Field Foster, The Mechanical Testing of Metals and Alloys 7th Edition, Cousens Press, 2017.

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2. ASM Metals Handbook, Non-Destructive Evaluation and Quality Control, American Society_of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., Modern Techniques in Metallography, Von Nostrand Inc. NJ, USA.

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3. www.defra.gov.uk/environment/waste/index.htm
4. www.ec.gc.ca
5. www.environment.gov.au

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	3
AVG	3	2

JCE9011	ENVIRONMENTAL LEGISLATIONS IN INDUSTRIES	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To impart knowledge on the legislations in India.
- To understand the basic principles in pollution control.
- To expose the students to the pollution control policies of Water and Air.
- To acquire knowledge on salient features of Environmental Act.
- To apply techniques and approaches for minimizing the generation of Electronic Waste.

UNIT- I THE WATER (PREVENTION & CONTROL OF POLLUTION) ACT, 9

Definitions-Salient features-Powers &functions of Regulatory agencies – Responsibilities of occupier, provisions relating to prevention& control-procedures to obtain consent- Monitoring and compliance mechanisms-legal provision for violation of Water(P&CP)Act-Case studies on water polluting industries-Textile dyeing, Paper mills-Electroplating, Starch industries-inventorisation of new water polluting industry and its management-field visits.

UNIT-II THE AIR (PREVENTION & CONTROL OF POLLUTION) ACT 9

Definition-Salient features- Powers &functions of Regulatory agencies -National ambient Air quality standards-Emission standards for industries specific- Responsibilities of occupier, provisions relating to prevention& control-procedures to obtain consent Monitoring and compliance mechanisms- legal provision for violation of Air(P&CP)Act- Case studies on Air polluting industries-Foundries, Cement, Thermal power plants inventorisation of new Air polluting industry and its management-field visits.

UNIT-III THE ENVIRONMENT (PROTECTION) ACT, 1986 9

Genesis of the Act-Salient features-Role of Central Government-various notifications and rules – prohibition on import of genetically modified organisms-chemicals-hazardous wastes- Batteries management-Restriction on Ozone depleting substances-EIA notification-Sitting of industries-State level EIA Authorities-eco-mark-Control on noise pollution-coastal regulations- Monitoring and compliance mechanisms-Role of National Green Tribunals(NGT),Environmental courts &Public interest litigation -Case studies

UNIT-IV REGULATIONS ON INDUSTRIAL SOLID WASTE MANAGEMENT 9

Restriction on Hazardous waste-Bio-medical wastes-Recycled plastic wastes-Municipal solid wastes-e-waste-Salient features-Responsibilities of occupier/generator/local bodies/PCBs- Monitoring and compliance mechanisms-consent clearance, Authorisation, Registration procedures for industry specific-Issues &Challenges-Best practices-Case studies on lead refining, engineering units ,hospitals, plastic units, Municipal landfills,-field visits.

UNIT-V ELECTRONIC WASTE (MANAGEMENT &HANDLING) RULES2011 9

Definition-Environmental& Occupational Health hazards of e-waste-Salient features of E -waste Rules Extended producers responsibility-issues and challenges – Compliance and Consent Clearance mechanisms-Best practices of E-waste management-Case studies on E-waste recycling units, Bulk consumers, Collection Centers-field visits.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Explain the compliance mechanisms of Water Pollution Act
- Identify the legal requirements of Air Act
- Illustrate the salient features of Environmental Protection Act
- Describe the regulations on solid waste management.
- Conduct research to develop practices on E-waste management

TEXT BOOKS:

1. Rosencrannz, S. Divan, M.L.Noble, Environmental law and policy in India, cases, materials and statutes, Tripathi pvt.Ltd. Bombay.
2. Shyam Divan and Armin Roseneranz ―Environmental law and policy in India ―Oxford University Press, New Delhi, 2001.
3. Stem A.C. Air pollution, Vol. I to VIII, Academic press.

REFERENCES:

1. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York.
3. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2012.
4. Charles A. Wentz, Hazardous Waste Management, Second Edition, Pub: McGraw Hill International Edition, New York, 2017
5. E Waste Management In India (2016).

WEBSITE REFERENCES:

1. www.usepa.gov/epaoswer/hazwaste/recycle/ecycling/index.htm
2. www.defra.gov.uk/environment/waste/index.htm
3. www.ec.gc.ca
4. www.environment.gov.au
5. www.ewasteguide.info

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	2
CO4	3	2
CO5	3	2
AVG	3	2

JCE9012	BUILDING SERVICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge on principles of electrical services in buildings
- To study the electrical layout of the building
- To learn the mechanical services.
- To acquire knowledge on fire safety requirements of the buildings.
- To grasp knowledge Rainwater system, Green building and solar power system

UNIT- I OVERVIEW OF BUILDING SERVICES: 9

Definitions, Objective and uses of services, Applications of services for different types building - Classification of building services as per National building Code- Functional requirements of the building. Introduction to BMS- Role of BMS-Concept of Smart building

UNIT-II LIGHTING, VENTILATION AND ACOUSTICS 9

Natural and artificial lighting- principles and factors -Electrical installations and accessories of wiring, Types of insulation -Necessity of Ventilation, Types of ventilation – Natural and Mechanical, Factors to be considered in the design of Ventilation- Building Acoustics- Objectives and Control

UNIT-III MECHANICAL SERVICES IN BUILDINGS 9

Lift- Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts- Elevators & Escalators-Different types and Uses, Freight elevators, Passenger elevators, Hospital elevators - Air Conditioning- Purpose, Principles -Types of Air Conditioners, Central type, Window Type, Split Unit.

UNIT-IV FIRE PROTECTION 9

Fire - Causes and Effects , General Requirements of Fire Resisting Building as per IS: 1642:1989 and NBC 2005, Characteristics of Fire Resisting Materials , Maximum Travel Distance, Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs

UNIT-V MISCELLANEOUS SERVICES AND GREEN BUILDINGS PROVISIONS 9

Plan for Rain Water Harvesting in the New Buildings, Concept of GREEN Buildings, Components of GREEN Building, Components of Grey Water System, Management of Grey Water System and Distribution Pattern, Solar Power System

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Synchronize the construction activities with installation of building services engineering Explain the roles of public, private and Non-Governmental organizations.
- Select the relevant system for particular requirements of buildings.
- Suggest the specifications of the elevators required in the given building.
- Justify the provision of fire safety system.
- Ensure green building applications to the new constructions.
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TEXTBOOKS:

1. R. Udaykumar ; A text book on Building Services;Eswar Press, Chennai
2. S. M. Patil ; Building Services ; Seema Publication, Mumbai Revised edition
3. Bureau of Indian Standards; National Building Code of India – 2005;BIS, New Delhi

REFERENCES:

1. P. S. Gahlot ; Building repair and Maintenance Management ; CBS Publishers & Distribution(P) Ltd
2. IS: 1642:1989, Code of Practice for Fire Safety of Building
3. NBC 2016, National Building Code of India Government of India, National Housing Policy, 2002.
4. Dr. B. C. Punmia ; Building Construction ; Laxmi Publications (P) Ltd., New Delhi
5. P. C. Varghese ; Building Construction ; PHI Learning (P) Ltd., New Delhi

WEBSITE REFERENCES:

1. www.academia.edu
2. www.nptel.iitm.ac.in
3. http://en.wikipedia.org/w/index.php?title=Dumbwaiter_(elevator)&oldid=621761813"
4. www.bis.org.in/sf/nbc.htm
5. cpwd.gov.in/Units/handbook.pdf

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	-
CO5	1	-
AVG	1	-