



Approved by AICTE, New Delhi
Affiliated to Anna University



DEPARTMENT OF
CIVIL ENGINEERING

REGULATIONS 2024

Academic Year 2024-25 onwards

AUTONOMOUS
CURRICULUM AND

SYLLABUS
I - V
SEMESTERS

SRI SAIRAM ENGINEERING COLLEGE



VISION

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



MISSION

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



Educational Organization Management System (EOMS) Policy

We at Sri Sai Ram Engineering College are committed to empower our students not only to excel academically but also imbibe essential values, enabling them to become exemplary global citizens. We build a better nation by fostering excellence and innovative practices in Engineering, Technology and Management Education. We are dedicated to consistently enhancing our systems, infrastructure and services to meet the needs and expectations of all our stakeholders for sustainable growth

DEPARTMENT OF CIVIL ENGINEERING



VISION

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



MISSION

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

- M1** Create and provide a platform for continuous learning and sharing of knowledge in modern technological developments.
- M2** Encourage research activities with well-equipped laboratories to exhibit their true potential.
- M3** Inculcate ethical and moral values to become responsible engineers and better human being.

AUTONOMOUS CURRICULA AND SYLLABI**Regulations 2024****SEMESTER I**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA101	Matrices and Calculus	3	1	0	4	4
2	24HSEN101	Communicative English	3	0	0	3	3
3	24BSPH101	Engineering Physics	3	0	0	3	3
4	24BSCY101	Engineering Chemistry	3	0	0	3	3
5	24ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	24ESGE101	Engineering Graphics	1	2	0	3	3
7	24HSTA101	Heritage of Tamils	1	0	0	1	1
PRACTICALS							
1	24BSPL101	Physics and Chemistry Laboratory	0	0	4	4	2
2	24ESPL101	Programming in C Laboratory	0	0	2	2	1
VALUE ADDITIONS - I							
1	24ENTP101	Functional Life Skills	1	0	1	2	1
2	24ESID101	Idea Engineering Lab - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BOS					
Total						30	25

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA202	Differential Equations, Complex Variables and Transforms	3	1	0	4	4
2	24HSEN201	Professional English	2	0	0	2	2
3	24BSPH204	Physics for Civil Engineering	3	0	0	3	3
4	24BSCY201	Chemistry for Environment and Sustainability	3	0	0	3	3
5	24ESCE201	Engineering Mechanics	3	0	0	3	3
6	24HSTA201	Tamils and Technology	1	0	0	1	1
7	24HSNC201	NCC Course Level 1*	2*	0	0	2*	0
PRACTICALS							
1	24ESGE102	Engineering Practices Laboratory	0	0	4	4	2
VALUE ADDITIONS - II							
1	24ENTP201	Digital Dynamics	0	0	2	2	0
2	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
		Total				24	19

*only for NCC cadets, to be conducted beyond working hours

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24BSMA302	Linear Algebra and Partial Differential Equations	3	1	0	4	4
2	24CEPC301	Solid Mechanics	3	0	0	3	3
3	24CEPC302	Fluid Mechanics & Hydraulic Engineering	3	0	0	3	3
4	24CEPC303	Surveying	3	0	0	3	3
5	24CEPC304	Sustainable Construction Materials	3	0	0	3	3
6	24HSMC301	Universal Human Values - II Understanding Harmony	3	0	0	3	3
7	24HSNC301	NCC course Level 2*	3*	0	0	3*	0
PRACTICALS							
1	24CEPT301	Computer Aided Building Drawing Lab with Theory	1	0	4	5	3
2	24CEPL301	Surveying Laboratory	0	0	4	4	2
VALUE ADDITIONS - III							
1	24CETP301	Aptitude Skills - I	0	0	2	2	1
2	24CEID301	Innovative Design Lab - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC301	Joy of Computing using Python (Mandatory - NC)	0	2	0	2	0
Total						34	26

*only for NCC cadets, to be conducted beyond working hours

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS	
			L	T	P			
THEORY								
1	24BSMA403	Statistics and Numerical Methods	3	1	0	4	4	
2	24CEPC401	Soil Mechanics	3	0	0	3	3	
3	24CEPC402	Structural Analysis	3	0	0	3	3	
4	24CEPC403	Transportation Engineering	3	0	0	3	3	
5	24CEPC404	Construction Techniques, Equipment and Practices	3	0	0	3	3	
6	24MGOE9xx	Open Elective - I#	3	0	0	3	3	
7	24HSNC401	NCC course Level 3*	3*	0	0	3*	0	
PRACTICALS								
1	24CEPL401	Strength of Materials and Hydraulic Engineering Laboratory	0	0	4	4	2	
2	24CEPL402	Concrete & Highway Engineering Laboratory	0	0	4	4	2	
VALUE ADDITIONS - IV								
1	24CETP401	Aptitude Skills - II	0	0	2	2	0	
2	24CEID401	Innovative Design Lab - II	0	0	2	2	1	
ONLINE SUPPLEMENTARY								
As recommended by BOS					Total		31	24

*only for NCC cadets, to be conducted beyond working hours #Transportation Management

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CP	C	PREREQUISITE COURSES
			L	T	P			
THEORY								
1	24CEPC501	Foundation Engineering	3	0	0	3	3	24CEPC401
2	24CEEL5xx	Professional Elective - I	3	0	0	3	3	-
3	24CEEL5xx	Professional Elective - II	3	0	0	3	3	-
4	24XXOExxx	Open Elective-II*	3	0	0	3	3	-
5	24HSMG501	Principles of Engineering Management	3	0	0	3	3	24MGOE903
6	24MGMC501	Constitution of India	2	0	0	2	0	-
PRACTICALS								
1	24CEPL501	Soil Mechanics Laboratory	0	0	4	4	2	24ECPL303
VALUE ADDITIONS								
1	24CETP501	Skill Enhancement	0	0	2	2	1	-
2	24CEID501	Prototype Development Lab - I	0	0	2	2	1	-
ONLINE SUPPLEMENTARY								
		As recommended by BOS						
		Total					25	19

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24CEPC601	Environmental Engineering	3	0	0	3	3
2	24CEPC602	Reinforced Concrete Design	3	0	0	3	3
3	24CEPC603	Design of Steel Structures	3	0	0	3	3
4	24CEEL6yy	Professional Elective - III	3	0	0	3	3
5	24CEEL6zz	Professional Elective - IV	3	0	0	3	3
6	24xxOE9xx	Open Elective III	3	0	0	3	3
PRACTICALS							
1	24CEPL601	Environmental Engineering Laboratory	0	0	4	4	2
VALUE ADDITIONS - VI							
1	24CETP601	Technical Skill	0	0	2	2	0
2	24CEID601	Prototype Development Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BOS	Total			26	21

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	24CEPC701	Estimation and Quantity Surveying	3	0	0	3	3
2	24CEPC702	Advanced Reinforced Concrete Design	3	0	0	3	3
3	24CEEL7xx	Professional Elective - V	3	0	0	3	3
5	24XXOE9xx	Open Elective - IV	3	0	0	3	3
6	24MGEL703	Creative Innovation and Entrepreneurship	2	0	0	2	2
PRACTICALS							
1	24CEPT01	Revit Architecture Lab with theory	1	0	4	5	3
2	24CEPJ701	Project Work - Phase I	0	0	8	8	4
VALUE ADDITIONS - VII							
1	24CETP701	Company Specific Skills	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BOS					
		Total				29	22

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24CEEL8xx	Professional Elective – VI	3	0	0	3	3
PRACTICALS							
1	24CEPJ801	Project Work - Phase II	0	0	12	12	6
VALUE ADDITIONS - VIII							
1	24CEIN801	Internship	0	0	9	9	3
Total						24	12

AUTONOMOUS CURRICULA AND SYLLABI

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PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN	PREREQUISITE COURSES
1	24CEEL501	Principles of Construction Management	3	Construction Materials and Technology	24CEPC304, 24CEPC404
2	24CEEL502	Infrastructure Planning and Managements	3	Construction Materials and Technology	24CEPC304, 24CEPC404
3	24CEEL503	Strategic Planning for Infrastructure Sectors	3	Construction Materials and Technology	24CEPC304, 24CEPC404
4	24CEEL504	Introduction to Engineering Seismology	3	Structural Engineering	24CEPC301, 24CEPC402
5	24CEEL505	Structural System in Architecture	3	Structural Engineering	24CEPC301, 24CEPC402
6	24CEEL506	Optimization methods for Civil engineering	3	Structural Engineering	24CEPC301, 24CEPC402
7	24CEEL507	Renewable Energy Systems	3	Environmental Engineering	24CEPC201, 24CEPC302
8	24CEEL508	Air pollution and control Engineering	3	Environmental Engineering	24CEPC301, 24CEPC402
9	24CEEL509	Municipal Solid Waste Management	3	Environmental Engineering	24CEPC301, 24CEPC404
10	24CEEL510	Sustainable Architecture	3	Transportation and Urban Planning	24CEPC304, 24CEPC404
11	24CEEL511	Housing Policy & Planning	3	Transportation and Urban Planning	24CEPC303
12	24CEEL512	Introduction to Urban Planning	3	Transportation and Urban Planning	24CEPC303
13	24MGEL5xx	Intellectual Property Rights	3	Management	

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN	PREREQUISITE COURSES
1	24CEEL513	Concrete Technology	3	Construction Materials and Technology	24CEPC304
2	24CEEL514	Fire Protection, Services and Maintenance Management of Building	3	Construction Materials and Technology	24CEPC404
3	24CEEL515	Disaster Management and Mitigation in Construction	3	Construction Materials and Technology	24CEPC404, 24CEPC501, 24CEPC604
4	24CEEL516	Introduction to FEM	3	Structural Engineering	24ESCE201, 24CEPC301, 24CEPC402
5	24CEEL517	Masonry Structures	3	Structural Engineering	24ESCE201, 24CEPC301, 24CEPC402
6	24CEEL518	Structural Health Monitoring	3	Structural Engineering	24ESCE201, 24CEPC301, 24CEPC402
7	24CEEL519	Environmental Impact Assessment	3	Environmental Engineering	24BSCY201
8	24CEEL520	Hydrology and Water Resource Engineering	3	Environmental Engineering	24BSCY201, 24CEPC302
9	24CEEL521	Integrated Waste Management for a Smart City	3	Environmental Engineering	24BSCY201, 24CEPC302
10	24CEEL522	Remote Sensing and GIS	3	Transportation and Urban Planning	24BSCY204, 24CEPC303
11	24CEEL523	Remote Sensing: Principles and Applications	3	Transportation and Urban Planning	24BSCY204, 24CEPC303
12	24CEEL524	Global Navigation Satellite Systems and Applications	3	Transportation and Urban Planning	24CEPC404, 24CEPC501, 24CEPC604
13	24MGEL5vv	Total Quality Management	3	Management	

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
L&T

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24CEIE501	Design and Construction of Highways and Pavements	3	Transportation Engineering
2	24CEIE502	Engineering Strategies for Sustainability	3	Environmental Engineering
3	24CEIE503	Sustainability Practices in Design of Buildings	3	Environmental Engineering
4	24CEIE504	Transportation Infrastructure for Architects	3	Transportation Engineering
5	24CEIE601	Concrete Building Systems Design	3	Structural Engineering
6	24CEIE602	Precast Members - Systems & Construction	3	Structural Engineering
7	24CEIE603	Structural Steel Buildings - Design and Practices	3	Structural Engineering
8	24IEPJ701	Project Management for Professionals	3	Interdisciplinary
9	24CEIE702	Metro Rail Transportation Systems & Construction	3	Transportation Engineering
10	24CEIE703	Solid Waste Engineering and System Design	3	Environmental Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1** Excel in the fundamentals of mathematics, basic sciences, communication and Civil Engineering concepts to solve the real world Civil Engineering problems by imparting sound technical knowledge.
- PEO2** Compete professionally with suitable and modern technological skills in the field of research and higher studies.
- PEO3** Realize and practice ethical, environmental and professional responsibilities for sustainable development of society and nation.
- PEO4** Exhibit strong leadership quality, eagerness for lifelong continuous learning to adopt themselves in Civil Engineering domain

PROGRAM SPECIFIC OUTCOMES (PSOs)

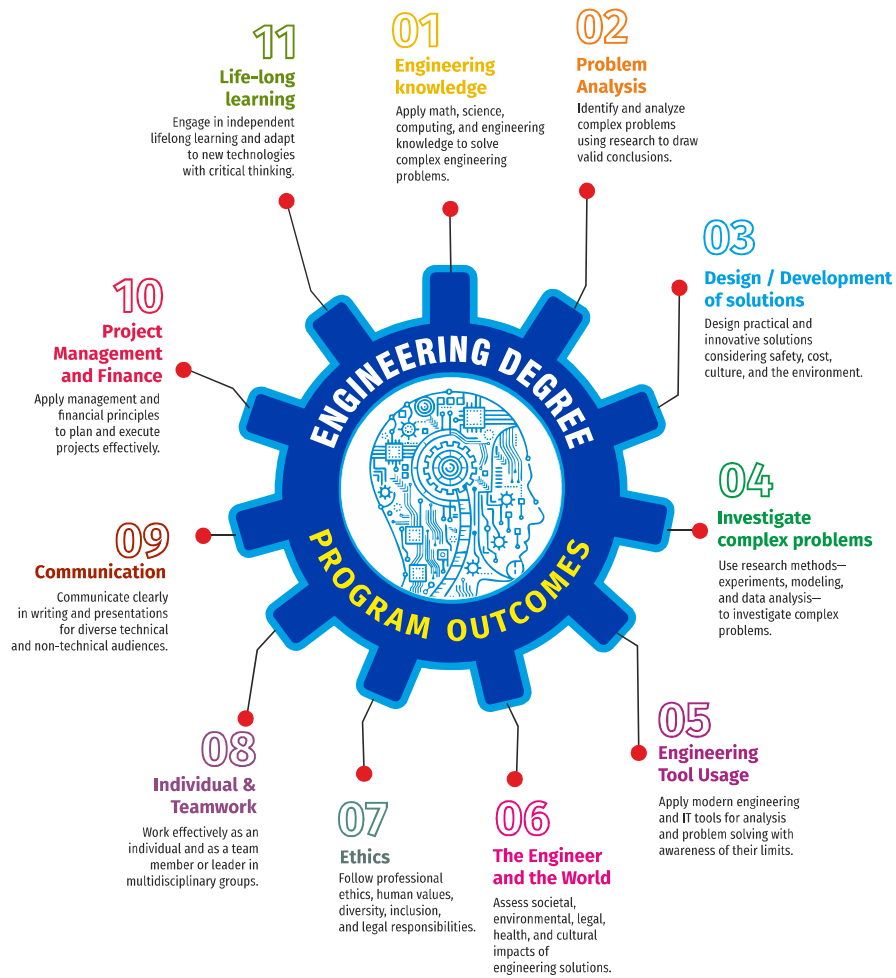
- PSO1** Capably design and build civil engineering-based systems in the context of environmental, economical, and societal requirements and serve the community as ethical and responsible professionals.
- PSO2** Be Able to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations and engage in lifelong learning for professional growth.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences (BS)	16	32	30
Engineering Sciences (ES)	7	15	12
Humanities and Social Sciences (HS)	8	15	14
Professional Electives (EL)	12	20	20
Program Core + Program Lab (PC+PL)	31	66	54
Program theory with Lab (PW) / Program Lab With Theory (PT)	5	5	3
Open Elective (OE)	7	12	12
Training & Placement (TP)	2	14	4
Innovation & Development (ID) / Project (PJ)	10	32	16
Internships (IN)	2	9	3
Mandatory Courses (MC)	0	2	0
Total	100	222	168

PROGRAMME OUTCOMES(POs)

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



SEMESTER - I

24BSMA101 - SDG NO. 4	MATRICES AND CALCULUS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives, maxima and minima for functions of several variables.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To provide understanding of double integration, triple integration and their applications.
- To impart the knowledge of Fourier series..

MODULE - I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (without proof) – Symmetric and orthogonal matrices - Reduce the Quadratic to Canonical form using orthogonal transformation - Nature of Quadratic forms.

MODULE - II FUNCTIONS OF SEVERAL VARIABLES**12**

Limits, Continuity - Definitions - Partial derivatives -Taylor's series - Jacobians, Maxima and Minima - Method of Lagrange multipliers.

MODULE - III VECTOR DIFFERENTIATION**4**

Scalar and Vector valued functions- Gradient and Directional derivatives – Tangent plane - Divergence and Curl- Irrotational and Solenoidal vector fields - Scalar and Vector Potentials - Vector identities (without proof).

MODULE - IV VECTOR INTEGRATION**8**

Line integral over a plane curve - Surface integral - Area of a curved surface - Volume integral - Greens, Gauss divergence and Stoke's theorems -Verification and Application in evaluating line, Surface and Volume integrals. Problems involving Cube and Cuboids.

MODULE - V MULTIPLE INTEGRALS**12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Change of variables from cartesian to polar coordinates- Triple integrals – Volume of solids - Change of variables from cartesian to Spherical and Cylindrical polar coordinates.

MODULE - VI FOURIER SERIES**12**

Fourier series – Convergence of Fourier series -Half range Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS**TEXT BOOKS:**

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
2. Engineering Mathematics for first year, T. Veerarajan, Tata McGraw-Hill, New Delhi, 2008.
3. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, 9th Edition, Laxmi Publications, Reprint, 2008.
4. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.

WEB REFERENCES:

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

ONLINE RESOURCES:

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

COURSE OUTCOMES:

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

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)
2. Evaluate the limit, examine the continuity and use derivatives to find extreme values for functions of several variables. (K3)

Board of Studies of HVS dept. | 2 |

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Department of Human & Social Sciences

3. Compute the derivatives of scalar and vector point functions. (K3)
4. Use the vector point function to establish the relation between line, surface and volume integrals. (K3)
5. Apply double and triple integrals to find the area and the volume of a region. (K3)
6. Compute Fourier series expansion of a function. (K3)

CO-PO Mapping:

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

SEMESTER - I

24HSEN101	COMMUNICATIVE ENGLISH	L	T	P	CP	C
SDG NO. 4		3	0	0	3	3

OBJECTIVES:

- Develop the basic LSRW skills
- Acquire enhanced knowledge of English grammar
- Improve modern and technical vocabulary
- Enhance the communicative and cognitive skills
- Interpret the texts and write reviews critically

MODULE - I COMMUNICATION PROCESS**8**

Listening – informal conversations - Speaking – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - Reading comprehension – skimming/ scanning/ predicting – question & answers – objective and descriptive answers - Writing – paragraph writing, personal notes - Language Development – parts of speech, prefix, suffix, word formation

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MODULE - II LANGUAGE BARRIERS, LEVELS AND CHANNELS 8

Listening –interviews - Speaking – describing a simple process – asking and answering questions - Reading – critical reading – finding key information in a given text – ideation, mind mapping - Writing - dialogue,, instructions – Language Development – regular, irregular verbs, tenses, framing questions,

MODULE - III NARRATION AND SUMMATION 8

Listening - long texts - TED talks - extensive speech on current affairs - Speaking – role plays – asking about routine actions and expressing opinions - Reading- longer texts & making a critical analysis of the given text - Writing – essay (comparative / analytical), jumbled sentences, recommendations - Language Development – writing single sentence definitions, sequence words

MODULE - IV WRITING MECHANICS 7

Listening -debates and discussions – practicing multiple tasks –Speaking - self introduction about friends/ places/ hobbies - Reading -Making inference from the reading passage – Predicting the content of the reading passage - Writing – informal letters, e-mails - accuracy, coherence, brevity – Language Development- single word substitutes, compound words- conditionals

MODULE - V INTERPRETATION SKILLS 7

Listening- popular speeches and presentations - Speaking - impromptu speeches -Reading - articles – magazines - Writing – review writing, channel conversion – bar diagram/ table, poster/ picture interpretation - Language Development – modal verbs, collocations, 21st century vocabulary

MODULE - VI COGENT EXPOSITIONS 7

Listening - Motivational speeches - Speaking - Debates and discussion - Reading - analytical reading - newspapers - Writing - process description - Language Development - voices, sentences expressing purpose, synonyms & antonyms

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. A Course in Technical English, D. Praveen Sam and K.N. Shoba, Cambridge University Press, 2020

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REFERENCES:

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

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

ONLINE RESOURCES:

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

OUTCOMES:

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

1. Improve understanding and application of listening, speaking, reading, and writing skills (K2)
2. Demonstrate the ability to write personal notes, clear and coherent paragraphs (K2)
3. Apply analytical skills to write essays, rearrange jumbled sentences, and formulate recommendations (K3)
4. Apply skills to develop email etiquette and construct professional emails and informal letters (K3)
5. Analyze and interpret data to write comprehensive and effective reviews (K3)
6. Enhance vocabulary, improve grammatical accuracy, and confidently engage in debates (K2)



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CO-PO, PSO Mapping:

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

SEMESTER - I

24BSPH101	ENGINEERING PHYSICS	L	T	P	CP	C
SDG NO. 4,7,9,11		3	0	0	4	3

OBJECTIVES:

- To understand the basic concepts of mechanics and its use in engineering applications.
- To understand the concept of waves and lasers and its applications.
- To illustrate the various laws of electromagnetic waves and its applications.
- To apply the concepts of quantum mechanics to engineering studies.
- To understand the basics of crystal for engineering applications.
- To identify the basic principles involved in thermal physics and its applications.

MODULE - I PROPERTIES OF MATTER

8

Elasticity – Hooke's law- Poisson's ratio - Stress - strain diagram and its uses - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders.

MODULE - II MECHANICAL WAVES AND LASERS

7

Waves on a string – standing waves – traveling waves – Energy transfer of a wave – Reflection and refraction of light waves – interference – Theory of air wedge and experiment - Theory of laser – characteristics – Spontaneous and stimulated emission – Einstein's coefficients – population inversion – Nd-YAG laser, CO₂ laser – Basic applications of lasers in industry.

Recommended by

Board of Studies of HKS dept.

Meeting No. 6 Date 31/08/2024

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MODULE - III ELECTROMAGNETIC WAVES**8**

The Maxwell's equations – wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field – properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter – polarization – Producing electromagnetic waves – Energy and momentum in EM - Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.

MODULE - IV BASIC AND APPLIED QUANTUM MECHANICS**7**

Black body radiation – Planck's derivation – Electrons and matter waves –The Schrodinger equation (Time dependent and time independent forms) – significance of wave function – Normalization –Free particle – particle in a infinite potential well: 1D, 2D and 3D Boxes; - Barrier penetration and quantum tunneling (qualitative) – Scanning Tunneling Microscope.

MODULE - V CRYSTAL PHYSICS**8**

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - X-Ray diffraction - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy. Crystal Growth: Chochralski technique - Molecular beam epitaxy.

MODULE - VI THERMAL PHYSICS**7**

Transfer of heat energy - Conduction, Convection and Radiation - Thermal conductivity, Forbe's method and Lee's disc method - Conduction through compound media - series and parallel methods - Heat exchangers - Refrigerators and Solar water heaters.

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

Recommended by	
Board of Studies of	HAS dept. 7
Meeting No.	6 Date: 31/08/2019

S. Namakniya
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Board of Studies
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REFERENCES:

1. D. Halliday, Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma, "Physics for Engineers", PHI Learning Private Limited, 2014.
4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H. Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.
7. Arthur Beiser. "Concepts of Modern Physics", McGraw-Hill, 6th Edition. 2003.
8. Charles Kittel, "Introduction to Solid State Physics". John Wiley & Sons. 8th Edition, 2005.

OUTCOMES:

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

1. Apply the concepts of stress, torsion, and bending to study the mechanical behavior of structural elements using theoretical and experimental methods. (K3)
2. Analyze wave phenomena and interference to study energy transfer, and evaluate laser principles with their industrial applications. (K4)
3. Examine Maxwell's equations and electromagnetic wave theory to analyze wave propagation, polarization and reflection-transmission phenomena in different media (K4)
4. Utilize the principles of quantum mechanics to explain black body radiation, matter waves, particle confinement in potential wells and tunneling phenomena. (K3)
5. Examine and compare the characteristics of various crystal structures, polymorphic forms, and crystal growth techniques. (K4)
6. Apply the principles of heat transfer to determine the thermal conductivity and explain the role of heat exchangers in refrigerators and solar water heaters. (K3)

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CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	-	-	-	-	-	-	-	-	-	-
C02	-	3	-	-	-	-	-	-	-	-	-
C03	-	3	-	-	-	-	-	-	-	-	-
C04	3	-	-	-	-	-	-	-	-	-	-
C05	-	3	-	-	-	-	-	-	-	-	-
C06	3	-	-	-	-	-	-	-	-	-	-

SEMESTER - I

24BSCY101 - SDG NO. 4,7,8,9,11,12,17	ENGINEERING CHEMISTRY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To enumerate the importance, synthesis, and applications of polymers.
- To impart basic knowledge of chemistry and the principles involved in electrochemistry, energy storage devices, and their commercial applications.
- To familiarize the fundamental laws and concepts of important photophysical and photochemical processes, as well as spectroscopy.
- To explore the fundamental concepts, laws, and principles of thermodynamics, and apply its derivations to optimize and innovate engineering processes across various disciplines.
- To comprehend the chemistry of fuels and combustion, and their applications across various engineering and industrial processes.
- To gain an understanding of the emergence and challenges of nanomaterials and nanotechnology across various scientific and technological disciplines.

MODULE -I POLYMER CHEMISTRY

8

Polymers: Definition, Degree of polymerization, Functionality of monomer, Classification of polymer with examples, Types of polymerization, Mechanism of addition polymerization (Free radical mechanism).

Plastics: Definition and Characteristics - Thermoplastics & Thermosets. Preparation, properties and engineering applications of plastics -PVC, Teflon, Kevlar and Bakelite.

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Fibers: Characteristics fibers - Preparation, properties and applications of Nylon and Dacron. Biodegradable polymers & Conducting Polymers: Characteristics, Classification and their applications.

MODULE - II ELECTROCHEMISTRY AND BATTERY TECHNOLOGY 7

Electrochemistry: Types of Cells (Electrochemical and Electrolytic cell) - Redox reaction - Single and Standard electrode potential, Reference electrodes - SHE, Calomel electrode, Measurement of Single Electrode Potential, Nernst equation (Derivation & Problems), Electrochemical series and its significance.

Batteries: Evolution of batteries - Primary and Secondary battery (Lead acid battery), Next Generation Battery Technology (NGBT) - Solid-state batteries (Lithium-ion), Sodium-ion batteries.

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY 7

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Quantum efficiency - determination-Photo processes - Jablonski diagram (Internal Conversion, Intersystem crossing, Fluorescence, Phosphorescence), Chemiluminescence and Photosensitization.

Spectroscopy: Electromagnetic spectrum - Absorption of radiation - Electronic, Vibrational and Rotational transitions. UV-visible and IR spectroscopy - principles, instrumentation (Block diagram only).

MODULE - IV CHEMICAL THERMODYNAMICS 8

Terminology of Thermodynamics - Laws of Thermodynamics - I law - Significance - Mathematical formulation and its applications. II law - Need for the II law. Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes, entropy of phase transitions; Clausius inequality. Helmholtz and Gibbs free energy functions, Criteria of spontaneity, Maxwell relations, Gibbs-Helmholtz equation, Van't Hoff Isotherm and Isochore.

MODULE - V FUELS 8

Fuels: Introduction - Classification of fuels - Coal - Analysis of coal (proximate and ultimate). Carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - Petroleum - manufacture of synthetic petrol (Bergius process). Knocking - Octane number and Cetane number - Gaseous fuels - Compressed natural gas (CNG), Liquefied petroleum gas (LPG). Biofuels - Gobar gas and Biodiesel.

Combustion of fuels: Introduction - Calorific value - Higher and Lower Calorific values- Theoretical calculation of Calorific value (Dulong formula) - Fuel gas analysis (ORSAT Method).

MODULE - VI NANOCHEMISTRY

7

Introduction - Types of nanomaterials - Emergence and challenges in nanotechnology- Synthesis routes for nanomaterials: Bottom-up and top-down approaches - Sol-gel, precipitation, Thermolysis, Laser ablation, Chemical Vapour Deposition (CVD), Electro deposition - Properties of nanomaterials- Mechanical properties, Chemical, Optical, Electrical and Magnetic properties-applications of nanomaterials (Gold nanoparticles as an example). Quantum Dots - concept, properties and applications.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2024.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.
4. Chemistry of Nanomaterials Vol.1 S.S.R Kumar Challa (Ed).
5. Advanced chemistry by Phillip Matthews Vol.1 and Vol.2.
6. Chemistry in Engineering and Technology Vol. 1 & 2, J.C. Kuriacose and J. Rajaram.
7. Applied chemistry - A textbook for Engineers and Technologists by H.D. Gesser.
8. Chemical and Electrochemical Energy Systems, R. Narayanan, B. Viswanathan, University Press India Limited.

OUTCOMES:

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

1. Explain the importance of polymers in science and technology, describe their roles in different applications and discuss their impacts on modern advancements. (K3)

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2. Recognize the basic principles of electrochemistry and describe their application in battery technologies. (K3)
3. Apply the concepts of key photophysical and photochemical processes, as well as spectroscopy, to develop and optimize various applications. (K3)
4. Describe the principles of the second law of thermodynamics and its derivations to analyze engineering applications across all disciplines. (K3)
5. Categorize the chemistry of fuels and combustion and their applications at various levels. (K3)
6. Demonstrate the knowledge of nanomaterials, including their properties, behavior, interactions and applications across various disciplines of science and technology. (K3)

CO-PO, Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	2	3	-	-	2	-	-	-	-	-
C02	3	3	3	-	-	2	-	-	-	-	-
C03	3	2	3	-	2	-	-	-	-	-	-
C04	3	2	3	-	-	1	-	-	-	-	-
C05	3	2	2	-	-	-	-	-	-	-	-
C06	2	1	2	-	-	-	-	-	-	-	-

SEMESTER - I

24ESCS101 106105171 SDG NO. 4 & 9	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Interpret Mathematical problems using algorithms, flowchart and pseudocode.
- To understand the programming language.
- To develop C Programs using basic Programming Constructs, Loops, Arrays and Strings.
- To develop applications in C using Functions, Pointers and Structures.
- To perform I/O operations and File Handling in C.

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Meeting No. 7 Dated: 30/05/2024

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MODULE - I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING 7

Introduction to Problem Solving through programs- Algorithm-Flowchart-Pseudocode-Memory, Variables, Values, Instructions, Programs-compilation process-Syntax and Semantic Errors- The language of C : Phases of developing a running computer program in C - Character set - Constants - Keywords - Primitive data types -Declaration, Type Conversion.

MODULE - II BASICS OF C PROGRAMMING 7

Sequential- Arithmetic Operators, Relational Operators, Logical Operators, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, selective - If, Else-If, Switch- repetitive structures-for, while, do while, Nested loops, go to, break, continue -Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD and LCM, Prime number generation.

MODULE - III ARRAYS AND STRINGS 8

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

MODULE - IV FUNCTIONS AND POINTERS 9

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) - Recursion - Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions - Factorial and Fibonacci Generation - Towers of Hanoi problem - Pointers - Pointer Operators - Pointer Arithmetic - Arrays and Pointers -Array of Pointers - Example Program: Sorting of Names - Parameter Passing: Pass by Value - Pass by Reference - Example Program: Swapping of Two Numbers using Pass by Reference.

MODULE - V STRUCTURES 7

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

MODULE - VI FILE PROCESSING 7

Files - Types of File Processing: Sequential Access, Random Access - Sequential Access File - Example Program: Finding Average of Numbers stored

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Board of Studies of CSE dept.
Meeting No. 7 Dated: 30/06/2011

in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files - Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. R.G. Dromey, "How to solve it by Computers", Reprint, PHI Publishers, 2011.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2018.
3. Kernighan, B.W and Ritchie D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

1. Yashwant Kanetkar, "Let us C", 18th Edition, BPB Publications, 2021.
2. Byron Gottfried, "Programming with C", Fourth Edition, Tata McGraw Hill Education, 2018.
3. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication, 2015.
4. Jeri R. Hanly & Elliot B.Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
5. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

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

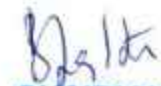
ONLINE RESOURCES:

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

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OUTCOMES:

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

1. Solve basic problems using algorithms, flowcharts, and pseudo code. (K3)
2. Analyze the various programming constructs for basic computational problems. (K4)
3. Implement simple C programs using arrays and strings. (K3)
4. Use functions, recursion, and pointers to perform calculations, searching, and sorting. (K3)
5. Apply structures and dynamic memory allocation in handling complex programming tasks. (K3)
6. Organize sequential and random file processing techniques to provide solutions for real-world computational problems. (K4)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	-	3	-	-	-	-	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	-	-	-	-	-	1	2
C04	-	3	-	-	-	-	-	-	-	-	-	2	2
C05	-	3	-	-	-	-	-	-	-	-	-	2	3
C06	-	-	3	-	-	-	-	-	-	-	-	3	3

SEMESTER - I

24ESGE101	ENGINEERING GRAPHICS	L	T	P	CP	C
- SDG NO. 4, 6, 7, 9, 12, 14 & 15		1	2	0	3	3

OBJECTIVES:

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

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Board of Studies
Mechanical Engineering

MODULE - I PLANE CURVES**6+4**

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

MODULE - II PROJECTION OF POINTS, LINES AND PLANES**6+4**

Projection of Points (Concept only). Projection (Elevation and Plan) of straight lines, inclined to both reference planes by rotating line method. Projection of plane surfaces, inclined to one of the reference planes by rotating object method.

MODULE - III PROJECTION OF SOLIDS**6+4**

Projection of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to one of the reference planes.

MODULE - IV ORTHOGRAPHIC PROJECTION**6+4**

Orthographic Projection - Principles of orthographic projections, Orthographic projection of objects from pictorial view.

MODULE - V SECTION AND DEVELOPMENT OF LATERAL SURFACE 6+4

Projection of sectioned solids (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to HP alone and cutting plane inclined to HP only. Development of lateral surfaces of sectioned regular vertical solids (Prisms, Pyramids, Cylinder and Cone) with cutting plane inclined to HP only.

MODULE - VI ISOMETRIC PROJECTIONS**6+4**

Isometric projection – Principle, isometric scale, Isometric views and Isometric projections of truncated solids - Prisms, Pyramids, Cylinder and Cone in simple vertical positions only.

TOTAL: 60 PERIODS**TEXT BOOKS:**

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

Recommended by	
Board of Studies of <u>Mech</u> dept.	
Meeting No. <u>8</u>	Dated: <u>1.6.24</u>

Rejith Kumar
CHAIRMAN
 Board of Studies
 Mechanical Engineering

REFERENCES:

1. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

WEB REFERENCES:

1. <https://archive.nptel.ac.in/courses/112/102/112102304/>

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105/104/105104148/>
2. <https://nptel.ac.in/courses/112/103/112103019/>

OUTCOMES:

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

1. Perform free hand drawing of conical sections and cycloids. (K3)
2. Sketch the orthographic projection of lines and plane surfaces of rectangle, square, pentagon and Hexagon. (K3)
3. Draw the orthographic projection of regular solids like prism, pyramids, cylinder and cone using change of position method. (K3)
4. Draw plan, elevation and side views for the 3dimensional isometric drawing by using the concepts of orthographic projection. (K3)
5. Draw the section and development of lateral surfaces for the regular solids like Prism, Pyramid, Cylinder and Cone for the axis perpendicular to HP. (K3)
6. Draw the isometric view, projection for regular and truncated solids like Prism, Pyramid, Cylinder and Cone. (K3)

CO-PO, PSO MAPPING:

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

SEMESTER - I

24HSTA101	HERITAGE OF TAMILS	L	T	P	CP	C
SDG NO. 4		1	0	0	1	1

OBJECTIVES:

- Develop interest for classical language and literature to promote Tamil heritage
- Understand the ancient Tamil sculptures, folk and martial arts and contribution of Tamil to the freedom of India

அலகு ஐ மொழி மற்றும் இலக்கியம்

இந்திய மொழிக் குடும்பங்கள் — திராவிட மொழிகள் — தமிழ் ஒரு செம்மொழி — தமிழ் செவ்விலக்கியங்கள் — சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை — சங்க இலக்கியத்தில் பகிர்தல் அறம் — திருக்குறளில் மேலாண்மைக் கருத்துகள்

UNIT I LANGUAGE AND LITERATURE

5

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural

அலகு II இடைகால மற்றும் நவீன இலக்கியங்கள்

தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம் — ஆழ்வார்கள் மற்றும் நாயன்மார்கள் — சிற்றிலக்கியங்கள் — தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி — தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

Unit II MEDIEVAL AND MODERN LITERATURE

5

Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

அலகு III மரபு ஓ பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை — சிற்பக் கலை

நடுகல் முதல் நவீன சிற்பங்கள் வரை — ஐம்பொன் சிலைகள் — பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் — தேர் செய்யும் கலை — சுடுமண் சிற்பங்கள் — நாட்டுப்புறத் தெய்வங்கள் — குமரிமுனையில் திருவள்ளுவர் சிலை — இசைக் கருவிகள் — மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் — தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

UNIT III HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 5

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures> Village deities> Thiruvalluvar Statue at Kanyakumari> Making of musical instruments - Mridhangam> Parai> Veenai> Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

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அலகு IV நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

UNIT IV FOLK AND MARTIAL ARTS

5

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

அலகு V தமிழர்களின் திணைக் கோட்பாடுகள்

தமிழகத்தின் தாவரங்களும், விலங்குகளும் — தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் — தமிழர்கள் போற்றிய அறக்கோட்பாடு — சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் — சங்ககால நகரங்களும் துறைமுகங்களும் — சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி — கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT V THINAI CONCEPT OF TAMILS

5

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

அலகு VI இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு — இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் — சுயமரியாதை இயக்கம் — இந்தியமருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு — கல்வெட்டுகள், கையெழுத்துப்படிிகள் — தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

UNIT VI CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

5

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India - Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine - Inscriptions & Manuscripts - Print History of Tamil Books.

TOTAL: 30 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு — மக்களும் பண்பாடும் — கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2. கணினித் தமிழ் — முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி — வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை — ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

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6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian> Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - „Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:

Upon completion of the course, the learners will be able to:

1. மொழிக் குடும்பங்களின் வரலாறு மற்றும் தமிழ் இலக்கியங்களை மதிப்பிடுகிறார்கள் Students evaluate the history of language families and Tamil literatures (K3)
2. பக்தி மரபுகளின் தாக்கம் பெற்ற தமிழ் இலக்கியங்களைப் புரிந்துகொள்கிறார்கள் Students understand Tamil literatures influenced by Philosophical and religious traditions (K3)
3. தமிழகத்தின் பாறை, சிற்பம், ஓவியம்- கலை மரபுகளைப் பகுப்பாய்வு செய்கிறார்கள் Students analyze the artistic traditions of Tamil Nadu such as rock art, sculpture, and painting (K3)
4. தமிழக நாட்டுப்புறக் கலைகள் மற்றும் தற்காப்புக் கலைகளின் மாண்புகளை உணர்ந்து கொள்கிறார்கள் Students realize the significance of Tamil Nadu's folk arts and martial arts (K3)
5. பழந்தமிழரின் திணையியல் வாழ்வியலை மீளாய்வு செய்கிறார்கள் Students re-examine the ecological lifestyle (Thinai-based life) of the ancient Tamils (K3)
6. தேசிய இயக்கம் மற்றும் இந்தியப் பண்பாட்டில் தமிழர்களின் பங்களிப்பினை நினைவுகூர்கிறார்கள் Students recall the contribution of Tamils to the National Movement and Indian culture (K3)

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CO-PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	3	3	-	-	-	-	-	-	-	2	2	2
C02	2	3	3	-	-	-	-	-	-	-	2	2	2
C03	2	3	3	-	-	-	-	-	-	-	2	2	2
C04	2	3	3	-	-	-	-	-	-	-	2	2	2
C05	2	3	3	-	-	-	-	-	-	-	2	2	2
C06	2	3	3	-	-	-	-	-	-	-	2	2	2

SEMESTER - I

24BSPL101 - SDG NO. 6,11,12,17	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	CP	C
		0	0	4	4	2

PHYSICS LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:

- Demonstrate the wave nature of light using diffraction and interference properties.
- Study the thermal conductivity of a bad conductor.
- Verify experimentally the elastic properties of materials.

Sl.No. Name of the Experiment

- 1 (a) Determination of wavelength of Laser
(b) Determination of numerical aperture and acceptance angle in an optical fiber.
(c) Determination of particle size using laser source.
- 2 Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- 3 Determination of Young's modulus by non-uniform bending method.

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- 4 Determination of the period of oscillation of a given torsional pendulum for a fixed length and find the rigidity modulus of the wire.
- 5 Find out the thickness of the given wire by air wedge method.
- 6 Calculation of lattice cell parameter – X-ray diffraction method.
- 7 Determination of Planck's constant.
- 8 Determination of wavelength of mercury spectrum – spectrometer grating.
- 9 Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
- 10 Determination of band gap of a semiconductor.
- 11 Determination of Hall coefficient by Hall Effect experiment.
- 12 Determination of solar cell characteristics.

CHEMISTRY LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:

- To acquaint students with practical knowledge of the basic concepts of chemistry that they will encounter during their studies and in the industry and engineering fields.
- To acquaint students with the determination of the molecular weight of a polymer by viscometry.
- To develop and understand the basic concepts of acidic and basic nature using pH.

Sl.No. Name of the Experiment

- 1 Conductometric titration of strong acid vs strong base.
- 2 Determination of chloride content of water sample by Argentometric method.
- 3 Determination of strength of acids in a mixture of acids using conductivity meter.
- 4 Determination of total, temporary & permanent hardness of water by EDTA method.
- 5 Estimation of iron content of the given solution using potentiometer.
- 6 Determination of DO content of water sample by Winkler's method.
- 7 Determination of strength of given hydrochloric acid using pH meter.
- 8 Estimation of iron content of the water sample using Spectrophotometer (1,10-Phenanthroline / thiocyanate method).

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- 9 Estimation of Sodium and Potassium in the given sample of water using Flame Photometer.
- 10 Determination of molecular weights of polymer samples using Ostwald's Viscometer.
- 11 Synthesis of nano-CdS by precipitation. (Demonstration only)
- 12 Corrosion experiment-weight loss method.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Engineering Physics Lab, Dr. G. SenthilKumar, VRB publishers. (2019)
2. Engineering Physics Practical, Dr. P. Mani, Dhanam Publications. (2020)

TEXTBOOK:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).
2. Practical Physical chemistry by B. Viswanathan, P. S. Raghavan (Vivabooks), 2009.
3. Foundation of Experimental Chemistry by Jubaraj B. Baruah, ParikshitGogoi, 2010.

OUTCOMES:

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

1. Apply the principles of elasticity and thermal physics to evaluate the various modulus of elasticity and conductivity of a bad conductor. (K3)
2. Explicate the properties of semiconductors by evaluating the band gap, I-V characteristics of solar cells and Hall effect of the materials. (K3)
3. Describe multiple measurement techniques, including volumetric titrations, conductivity, pH, redox potential and optical density measurements, used to estimate the amount of substance present in a solution. (K3)
4. Apply spectroscopic techniques, viscometry, synthesize nanoparticles, analyze the corrosion behavior of materials in different environments. (K3)

CO-PO MAPPING:

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

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SEMESTER - I

24ESPL101 - SDG NO. 4 & 9	PROGRAMMING IN C LABORATORY	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

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

LIST OF EXPERIMENTS

1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is a leap year or not?
(Hint: not every century is a leap. For example 1700, 1800 and 1900 is not a leap year).
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is an Armstrong number or not.
6. Write a program to check whether a given number is odd or even.
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to print half pyramid of *.
10. Write a program to display array elements using two dimensional arrays.
11. Write a program to perform swapping using a function.
12. Write a program to display all prime numbers between two intervals using functions.
13. Write a program to solve towers of Hanoi using recursion.
14. Write a program to get the largest element of an array using the function.
15. Write a program to concatenate two strings.
16. Write a program to find the length of String.
17. Write a program to find the frequency of a character in a string.
18. Write a program to store Student Information in Structure and Display it.



19. The annual examination is conducted for 10 students for five subjects.
Write a program to read the data and determine the following:
- Total marks obtained by each student.
 - The highest marks in each subject and the marks of the student who secured it.
 - The student who obtained the highest total marks.
20. Write a program to demonstrate file operations (e.g. count the number of characters, words and lines in a file, replace a specific word with the given word in the same file).

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Stand alone desktops with C compiler 30 Nos. (Or)
Server with C compiler supporting 30 terminals or more.

OUTCOMES:

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

- Apply basic constructs, arrays, strings, functions and recursion for executing C programming applications. (K3)
- Analyze C programs involving pointers and structures. (K4)
- Evaluate applications using sequential and random access files. (K5)

CO-PO, PSO MAPPING:

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

SEMESTER - I

24ENTP101	FUNCTIONAL LIFE SKILLS	L	T	P	CP	C
- SDG NO.4		1	0	1	2	1

OBJECTIVES:

- Resolve common communication problems
- Observe the effectiveness of nonverbal messages
- Communicate precisely through the digital media
- Understand the importance of empathetic listening
- Explore reading and speaking processes

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MODULE - I LISTENING

5

Techniques of effective listening
 Listening and comprehending
 Probing questions
 Barriers to listening
 Reflection from listening

MODULE - II SPEECH MECHANICS

5

Pronunciation
 Enunciation
 Vocabulary
 Fluency
 Common errors

MODULE - III READING SKILLS

5

Techniques of effective reading
 Kinds of reading
 Gathering ideas and information from the text
 Evaluating the ideas and information
 Interpreting the text from multiple angles

MODULE - IV WRITING ASPECTS

5

Writing process
 Effective writing strategies
 Different modes of writing
 Optimizing the use of resources
 Editing

MODULE - V PRESENTATION SKILLS

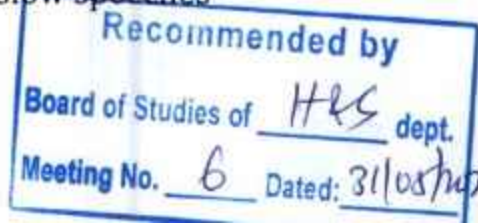
5

Types of presentations
 Nonverbal communication
 Understanding the purpose and the audience
 Beginning and closure of presentations
 Presentation tools and strategies

MODULE - VI ARTICULATION ASPECTS

5

Perform exercises
 Slow speeches



Long speeches
Monologues, Dialogues and Conversation
Feedback necessity

TOTAL : 30 PERIODS

REFERENCES:

1. Sen, Madhuchanda.2010, An Introduction to Critical Thinking, Delhi, Pearson.
2. Effective Communication Skills Strategies for Success. Edited by Nitin Bhatnager and Mamta Bhatnager. 2023, Pearson
3. Technical Communication: Principles and Practice, Meenakshi Raman and Sangeeta Sharma. Oxford University Press, 2015

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

OUTCOMES:

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

1. Employ reading, writing, and listening skills to communicate clearly in academic and professional contexts.
2. Demonstrate confident oral communication and presentation skills using appropriate tools and techniques.
3. Interpret ethical, inclusive, and culturally aware communication in team and societal settings

CO-PO, PSO MAPPING:

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

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SEMESTER - I

24ESID101 - SDG NO. 1-17	IDEA ENGINEERING LAB - I	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To understand the significance of Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) of the United Nations
- To familiarize with SDG targets and indicators
- To identify the Constitutional implementation pertaining to SDGs in Panchayat Raj
- To acquire knowledge of the State and the Central government welfare schemes
- To recognize the role of educational Institutions in community development
- To develop critical thinking skills to address complex societal challenges through an immersion program

MODULE - 1 United Nations Sustainability and the Sustainable Development Agenda **3**

- Introduction to Sustainability
- Indian Rural Environment: Necessity and Sustainability
- Millennium Development Goals (MDGs)
- United Nations Sustainable Development Goals (SDGs) & the Agenda
- Overview of the Sustainable Development Goals (SDGs)

MODULE - 2 Universal SDG Targets **4**

- SDG Framework
- Key Components
- Pillars of the SDGs
- Targets of the Goals
- Indicators of the Targets

MODULE-3 SDG and Indian Gram Panchayat **3**

- Gram Panchayat
- Salient Features of Constitutional Amendments
- Transition from SDGs to LSDGs (Localizing Sustainable Development Goals)

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MODULE-4 Government Schemes**4**

- Introduction to State and Central Government Schemes
- Overview of Government Schemes
- Localization and Implementation at the Regional Level
- Impact on Local Communities

MODULE-5 Community Engagement**4**

- Key Recommendations of the National Education Policy
- Guidelines for Fostering Social Responsibility
- Awareness
- Participation
- Collaboration

MODULE-6 Idea Generation**12**

- Immersion Program
- Focus Areas
- Channelizing Ideas
- Forming Working Teams for SDGs (Sustainable Development Goals)

TOTAL: 30 PERIODS**REFERENCES:**

1. Joy Elamon and Ms. Mariamma Sanu George, "The Handbook on Sustainable Development Goals and Gram Panchayats", State Institute for Rural Development (SIRD).
2. Dr.C.R.Rene Robin, Dr.PA.Shanthi, Dr.B.Thanuja & Dr.V.Yuvaraj, "Sairam SDG Idea Engineering Lab I", Sri Sairam Engineering College.

WEB REFERENCES

1. UN Sustainable Development Goals
2. <https://srmuniv.digimat.in/nptel/courses/video/109106200/L30.html>
3. <https://avcce.digimat.in/nptel/courses/video/109106200/L26.html>

OUTCOMES:**Upon completion of the course, the student will be able to:**

1. Analyse and apply the concepts of sustainability, Rural environment, Gram panchayat and various government schemes to design innovative practical solutions that address real life rural challenges. (K2)
2. Compare MDG's, SDG's and LSDG's to analyse village topology and identify specific development targets to propose innovative rural solutions. (K4)

3. Analyse the attainment levels of SDG's and write a reflective report on local community.(K4)
4. Formulate problem statement based on local community needs and propose innovative ideas for community development. (K4)
5. Perform an individual presentation of field observation by mapping them with relevant SDG's and justify their significance for rural development. (K4)

CO-PO, PSO MAPPING:

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

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SEMESTER - II

24BSMA202 SDG NO. 4	DIFFERENTIAL EQUATIONS, COMPLEX VARIABLES AND TRANSFORMS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

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

MODULE -I ORDINARY DIFFERENTIAL EQUATIONS

12

Second and Higher order linear differential equations with constant coefficients - Method of variation of Parameters -Homogeneous equation of Euler's and Legendre's type - System of simultaneous first order linear differential equations with constant coefficients.

MODULE- II COMPLEX VARIABLES

9

Analytic functions - Necessary and sufficient conditions for analyticity in cartesian and polar coordinates (without proof)- Properties- Harmonic Conjugate-Construction of analytic functions-Conformal mapping -Bilinear transformation ($w=1/z$).

MODULE -III COMPLEX INTEGRATION

9

Cauchy- Goursat theorem (without proof) - Cauchy Integral formula (without proof) - Zeroes of Analytic functions - Singularities - Laurent's Series - Residues - Cauchy Residue theorem (without proof).

MODULE -IV LAPLACE TRANSFORMS

12

Existence conditions - Transforms of elementary functions - Transform of Unit step function and Unit impulse function - Basic properties - Shifting theorems - Transforms of derivatives - Transform of Periodic functions - Inverse Laplace Transforms - Initial and Final value theorems - Convolution theorem (excluding proof) --- Application of solution of linear second order ordinary differential equations with constant coefficients.

MODULE -V FOURIER TRANSFORMS

9

Statement of Fourier integral theorem - Fourier transform pair - Fourier sine and cosine transforms - Properties - Convolution theorem - Parseval's identity

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MODULE - VI Z-TRANSFORMS**9**

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.

TOTAL: 60 PERIODS**TEXT BOOKS:**

1. Advanced Engineering Mathematics, Erwin Kresizg, 9th Edition, John Wiley & Sons, 2006.
2. Advanced Modern Engineering Mathematics, Glyn James, 3rd Edition, Pearson Education, 2010.

REFERENCES:

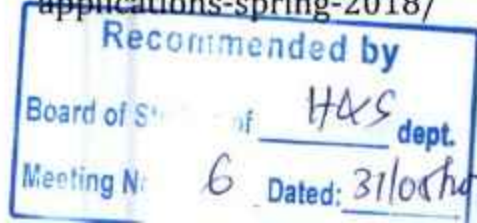
1. Higher Engineering Mathematics, Dass, H.K., and Er. Rajnish Verma, Reprint, S. Chand Private Ltd., 2011.
2. Higher Engineering Mathematics, B.S. Grewal, 44th Edition, Khanna Publishers, 2023.
3. Advanced Engineering Mathematics, Peter V. O'Neil, 7th Edition, Cengage learning, 2012.
4. An Introduction to Ordinary Differential Equations, E. A. Coddinton, 1st Edition, Prentice Hall, 1961.
5. Higher Engineering Mathematics, Ramana. B.V., 11th Reprint, Tata McGraw-Hill, New Delhi, 2010.
6. A Text Book of Engineering Mathematics, N. P. Bali and Manish Goyal, Reprint, Laxmi Publications, 2008.

WEB COURSES:

1. <http://archive.nptel.ac.in/courses/111/106/111106100/>
2. <https://nptel.ac.in/courses/111105134/> (Week-3 Complex Differentiation)
3. <https://nptel.ac.in/courses/111105134> (Week 4 Complex Integration)
4. <https://archive.nptel.ac.in/courses/111/106/111106111/>
5. <http://www.nptelvideos.com/course.php?id=90>

ONLINE RESOURCES:

1. <https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/lecture-1-introduction/>
2. <https://ocw.mit.edu/courses/18-04-complex-variables-with-applications-spring-2018/>



COURSE OUTCOMES:

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

1. Solve ordinary differential equations of second and higher order with constant coefficients, variable coefficients and simultaneous linear differential equations. (K3)
2. Construct an analytic function and apply the properties of analytic functions to check for harmonic and orthogonal functions and find the images of circle and straight lines under the standard transformations. (K3)
3. Use Cauchy's integral theorem, formula and Cauchy's Residue theorem to evaluate complex and real integrals, find the Taylor's and Laurent's series expansion. (K3)
4. Apply Laplace and inverse Laplace Transforms to solve the linear ordinary differential equations with constant coefficients. (K3)
5. Find Fourier transforms and Fourier sine and cosine transforms of simple functions. (K3)
6. Solve difference equations using Z-transforms. (K3)

CO-PO, MAPPING:

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

SEMESTER - II

24HSEN201	PROFESSIONAL ENGLISH	L	T	P	CP	C
SDG NO.4		2	0	0	2	2

OBJECTIVES:

- Acquire techniques for comprehending and critically analyzing passages
- Improve the communicative competence
- Enhance learners' ability to read and write complex texts, summaries, definitions and reports
- Write effective formal letters and reports

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- Develop skills for preparing effective job application

MODULE -I EFFECTIVE COMMUNICATION**6**

Listening – Listening to conversations – Speaking – making conversations in real life occurrences – Reading – short stories, happenings – Writing – autobiographical writing, preparation of checklist – communication and types of communication – Language Development – subject – verb agreement, commonly confused words – spellings

MODULE -II BASICS OF TECHNICAL WRITING**5**

Listening – listening to advertisements and products – Speaking – creating greetings/wishes/excuses and thanks – Reading – articles/novels – Writing – summary of articles, writing modes, formats, compositions – Language Development – reported speech, numerical adjectives

MODULE -III REPORT WRITING**4**

Listening – listening to podcasts – Speaking – practicing telephonic conversations – observing and responding. Reading – regular columns of newspapers/magazines – Writing – reports – feasibility, accident, preparation of agenda and minutes – Language Development – cause & effect expressions, discourse markers

MODULE -IV DIVERSE WRITING SKILLS**5**

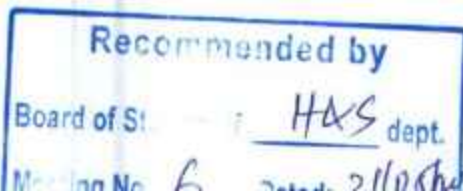
Listening – documentaries, anecdotes and short stories – Speaking – expressing opinions using verbal and non-verbal communication – Reading biographies/autobiographies, travelog, – Writing – formal letters – inviting guests – acceptance/declining letters – Language Development – degrees of comparison – embedded sentences – acronyms and abbreviations

MODULE -V CAREER COMPETENCIES**6**

Listening – expert talks – recommending suggestions & solutions – Speaking – Debate – participating in a group discussion – learning GD strategies – Reading – innovations, ideations – Writing – Job application, resume, – proposals – Language Development – verbal analogies – phrasal verbs

MODULE -VI LEXICAL ENHANCEMENT**4**

Listening – technical and general talks – Speaking – oral presentation with visual aids – Reading – successful stories/autobiographies – Writing – writing blogs – Language Development – common errors in English, idiomatic expressions

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.
2. Raman, Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford University Press.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York, 2011.
2. Raman, Meenakshi, Sharma, Sangeeta. Technical Communication. Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan & Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamil Nadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Vesilind Aarne P., Public Speaking and Writing Skills for Engineering Students (2nd Ed), Lakeshore press, 2007
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://takelessons.com/en-in/search?service=English&sort=1&utm_

ONLINE RESOURCES:

1. <https://www.coursera.org/specializations/improve-english?>
2. <https://www.fluentu.com/blog/educator-english/business-english-conversation-topics/>

OUTCOMES:

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

1. Demonstrate an understanding of various types of communication and prepare effective checklists. (K2)
2. Summarize articles/ write ups (K2)
3. Construct feasibility reports, accident reports, survey reports and meeting minutes (K3)
4. Apply skills to compose official letters with emphasis and clarity (K3)



5. Compose job applications and technical proposals (K3)
6. Demonstrate the ability to express opinions in both oral and written forms of communication (K2)

CO-PO, PSO MAPPING:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
C01	-	-	-	-	-	-	-	-	-	3	-	3	-	-
C02	-	-	-	-	-	-	-	-	-	3	-	3	-	-
C03	-	-	-	-	-	-	-	-	-	3	-	3	-	-
C04	-	-	-	-	-	-	-	-	-	3	-	3	-	-
C05	-	-	-	-	-	-	-	-	-	3	-	3	-	-
C06	-	-	-	-	-	-	-	-	-	3	-	3	-	-

SEMESTER - II

24BSPH204	PHYSICS FOR CIVIL ENGINEERING	L	T	P	CP	C
- SDG NO.4		3	0	0	3	3

OBJECTIVES:

- To create an awareness on natural disasters and safety measures
- To introduce the basics of heat transfer through different materials, thermal performance of building and various thermal applications
- To impart knowledge on the ventilation and air conditioning of buildings
- To enable the understanding of the fundamental knowledge about sound in building acoustical concepts.
- To introduce the concepts of sound insulation and lighting designs
- To correlate the theoretical principles with application oriented engineering studies.

MODULE-I GEOPHYSICS**8**

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

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MODULE - II THERMAL APPLICATIONS

7

Principles of heat transfer, steady state of heat flow – thermal insulation and its benefits – heat gain and heat loss estimation – factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices – central heating - thermal insulation paints.

MODULE - III VENTILATION AND REFRIGERATION

7

Requirements, principles of natural ventilation – ventilation measurements, design for natural ventilation - Window types and packaged air conditioners – chilled water plant – fan coil systems – water piping – cooling load – Air conditioning systems for different types of buildings – Protection against fire caused by A.C. Systems.

MODULE - IV ACOUSTICS

8

Introduction – Classification of sound– Characteristics of sound – decibel –Weber-Fechner law – Reverberation - Reverberation time - Sabine's formula – derivation using growth and decay method – Measurement of absorption Coefficient and its determination – Factors affecting acoustics of buildings and their remedies. Methods of sound absorptions – absorbing materials – sound insulation and its measurements.

MODULE - V LIGHTING DESIGNS

8

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

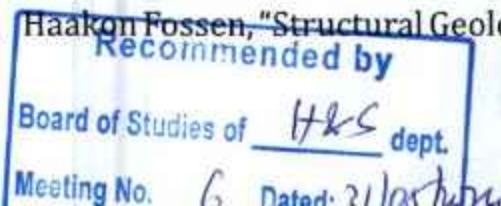
MODULE - VI NEW ENGINEERING MATERIALS

7

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

TOTAL = 45 PERIODS**TEXT BOOKS:**

1. Alexander.D. "Natural disaster", CRC Press, 2017.
2. Haakon Fossen, "Structural Geology", Cambridge University Press, 2016.



3. Hall, Matthew.R "Materials for energy efficiency and Thermal comfort in building" Woodhead publishing, 2010.
4. Roman Skowranek "Basics Building services Light design" Birkhauser 2017
5. Heinrich Kuttruff "Acoustics" S.Chand (G/L) & company Ltd, 2006
6. R.K.Rajput "Engineering Material" S.Chand & company, 2006.
7. P.Mani "Physics for Civil Engineering" Dhanam Publication, 2024

REFERENCES:

1. G.F.Hundy, A.R. Trott and T.C. Welch, "Refrigeration and Air Conditioning and Heat pumps", Elsevier, 2016.
2. Marc Asselineau, "Building Acoustics", CRC Press, 2015.
3. Hector Estrada, Luke S.Lee, "Introduction to earthquake", CRC press, 2017.
4. Shearer, P.M. "Introduction to Seismology", Cambridge University Press, 2019.
5. Haakon Fossen, "Structural Geology", Cambridge University Press, 2016.

OUTCOMES:

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

1. Illustrate the concepts of Earth's structure, earthquakes, and volcanoes to explain their causes, effects, and methods of hazard analysis (K3)
2. Apply heat transfer principles to assess building thermal performance and explain the effective insulation and comfort solutions (K3)
3. Analyze the principles, design, and performance of natural ventilation, air conditioning systems, and fire protection measures (K4)
4. Examine the characteristics of sound and building acoustics, and evaluate methods for sound absorption and insulation (K4)
5. Analyze the concepts of photometry, vision, and color to evaluate lighting performance and optimize daylight and artificial lighting in buildings (K4)
6. Have an insight on new engineering materials such as metallic glasses, shape memory alloys, ceramics, composites, biomaterials and their applications (K3)

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Meeting No	6 Dated: 31/05/2024

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CO-PO MAPPING:

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

SEMESTER - II

24BSCY201 - SDG NO.4	CHEMISTRY FOR ENVIRONMENT AND SUSTAINABILITY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To gain a comprehensive understanding of environmental science, the intricate relationships within ecosystems, and the crucial role of biodiversity conservation..
- To introduce the structure and components of the atmosphere, and provide an overview of the photochemical reactions involved.
- To foster a sound understanding of water quality parameters and water treatment techniques.
- To explore the various components of soil and understand the steps involved in Solid Waste Management (SWM).
- To advocate the benefits of renewable energy and promote awareness of sustainable energy practices..
- To implement the principles of Green Chemistry in alignment with the Sustainable Development Goals (SDGs).

MODULE -I INTRODUCTION TO ENVIRONMENTAL SCIENCE

8

Environment: Definition, concept of environment and its components - scope and importance of environment - need for public awareness.

Ecosystem: Structure and functions: Structures - Biotic and Abiotic components. Functions - Energy flow in ecosystems, food chains and food webs. Biogeochemical cycles (C, N & P), Ecological succession.

Recommended by
Board of Studies of HKS dept.
Meeting No. 6 Dated: 21/05/2024

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Board of Studies
Department of Humanities & Sciences

Biodiversity and its conservation: Definition, types, importance of biodiversity, values and threats to biodiversity. Endangered and endemic species - concept and basis of identification of 'Hotspots'; hotspots in India. Strategies for biodiversity conservation: in situ, ex situ and in vitro conservation.

MODULE - II ATMOSPHERIC CHEMISTRY

7

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect - role of greenhouse gases (CO_2 , CH_4 , N_2O , CFCs) on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures).

MODULE - III WATER CHEMISTRY

8

Importance and scope of water chemistry - Sources and impurities in water - Water Quality Parameters - Specifications as per WHO/BIS standards. Hardness of water, types, numerical problems on hardness of water. Softening of water - Internal treatment (Lime-soda, Phosphate, Calgon, Sodium Aluminate and Colloidal conditioning). External treatments: Ion exchange and Zeolite processes. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water by Reverse osmosis. Sustainable water management practices (water recycling and rainwater harvesting)

MODULE - IV SOIL CHEMISTRY AND SOLID WASTE MANAGEMENT

7

Soil Chemistry: Chemical composition of soil, Acid-Base and Ion-Exchange Reactions in Soil, Soil acidity and salinity. Importance of NPK in Soil Fertility. Modern agriculture - Impacts of both excessive and insufficient fertilizer use, alongside the effects of pesticides on soil chemistry and the environment. Sustainable agriculture - Approaches to improve soil salinity (leaching, soil amendments, crop rotation), Design and use of green pesticides for sustainable farming.

Solid Waste Management System: Sources and types of solid waste, Elements of solid waste management, Methods of residential and commercial waste collection, Treatment / processing - Incineration, Composting, Landfill - Dumpsite rehabilitation.

MODULE - V ENERGY AND ENVIRONMENT

8

Energy sources - Renewable and non-renewable energy sources. Principle and generation of solar energy (solar collectors, photo-voltaic modules, solar ponds), wind energy, geothermal energy; tidal energy, OTEC energy from

biomass, biofuels, Nuclear energy - fission and fusion, Nuclear fuels, Nuclear reactor – principles and types. Need for energy efficiency, Energy conservation and sustainability - action strategies for sustainable energy management from a future perspective.

MODULE - VI GREEN CHEMISTRY AND SUSTAINABILITY

7

Green Chemistry: Introduction to green chemistry, Principles of Green Chemistry (12-principles), the concept of atom economy and chemical synthesis, Important techniques used in green chemistry. Application of green chemistry, viz. replacement of ozone depleting substances including CFCs, manufacture of biodegradable polymers, use of H₂O₂ as benign bleaching agents in the paper industry.

Sustainable Development: Definition and concepts of sustainable development, Need for sustainable development; Sustainable development goals – 17 SDG goals.

Sustainable practices: Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment and Environmental Impact Assessment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.
4. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

REFERENCES:

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Chemistry for Environmental Engineering, Clair N. Sawyer, Perry L. McCarty, Gene F. Parkin, 4th Edition, McGraw-Hill.
5. Environmental Chemistry - Stanley Manahan, 11th Edition, CRC Press.

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Board of Studies of	H&S dept.
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OUTCOMES:

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

1. Develop a foundational understanding of environmental science, the interactions within ecosystems, the significance of biodiversity, and the importance of conservation strategies for maintaining ecological balance. (K3)
2. Identify the primary components of the atmosphere, explain the causes of atmospheric pollution, and propose basic strategies to promote a sustainable and clean atmosphere. (K3)
3. Demonstrate complex water quality parameters, and develop innovative methods for producing cost-effective soft water suitable for both industrial use and potable consumption. (K3)
4. Describe the composition and functions of soil components, analyze the sources and characteristics of solid wastes, and evaluate the methods and strategies employed in solid waste management (SWM). (K3)
5. Explain renewable and non-renewable resources, describe various methods for harnessing energy from different sources and explain their applications in various contexts. (K3)
6. Illustrate a comprehensive understanding of green chemistry principles and their alignment with sustainable development goals, preparing them to contribute to environmentally friendly and sustainable practices in their future careers. (K3)

CO-PO MAPPING:

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

Recommended by
Board of Studies of HVS dept.
Meeting No. 6 Dated: 31/08/2024

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Chairman
Board of Studies
Department of Humanities & Sciences

SEMESTER - II

24ESCE201 - SDG NO. 4, 9, 12	ENGINEERING MECHANICS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To learn the use scalar and vector analytical techniques for analysing forces.
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems
- To develop basic dynamics concepts – force, momentum, work and energy.
- To predict the effect of force and motion in the course of carrying out the design functions of Engineering

MODULE -I STATICS OF PARTICLES**7**

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

MODULE - II EQUILIBRIUM OF RIGID BODIES**9**

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

MODULE - III FRICTION**7**

Friction force – Types of friction-Laws of Coulomb friction – Simple contact friction-Two bodies in contact- Wedge friction, ladder friction- Rolling resistance.

MODULE - IV PROPERTIES OF SURFACES AND SOLIDS**8**

Centroids and Centre of Mass and Volume – Simple and Composite areas and solids -Theorems of pappus- Moments of Inertia of composite areas – Parallel

axis theorem and perpendicular axis theorem –Polar moment of inertia-Radius of gyration-Product of inertia-Principal moments of inertia of plane areas and composite areas – Principal axes of inertia-Mass moment of inertia –Prismatic, Cylindrical and spherical solids from first principle.

MODULE - V DYNAMICS-KINEMATICS

7

Displacement, Velocity and Acceleration – Relative motion - Curvilinear motion - Newton's laws of motion.

MODULE - VI DYNAMICS-KINETICS

7

D' Alembert's principle, Work Energy principle - Impulse and Momentum – Impact of elastic bodies. Rigid body motion-Translation and Rotation– General Plane motion of simple rigid bodies such as Cylinder, Disc or Wheel and Sphere.

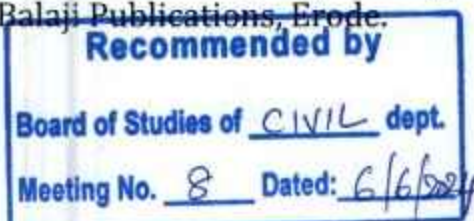
TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna MohanaRao. G., "Engineering Mechanics Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons, 1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
6. Dr.N.Kottiswaran, Engineering Mechanics (statics and Dynamics), Sri Balaji Publications, Erode.



WEB RESOURCES:

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

ONLINE RESOURCES:

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

OUTCOMES:

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

1. Interpret the concepts of laws of mechanics, vector operations, systems of Forces and equilibrium of particles in spaces. (K3)
2. Solve the engineering problems based on the concepts moment and couples, support and its types and equilibrium of rigid bodies in 3 dimensions. (K3)
3. Illustrate about Friction, its types, laws of friction, wedge and ladder friction. (K2)
4. Apply the concepts of centroid, centre of gravity, polar moment of inertia and principal moment of inertia for prisms, cylinder and spherical solids. (K3)
5. Solve engineering problems based on the concepts of relative motion and curvilinear motion. (K3)
6. Apply the concepts of Newton's law of motion, work energy method, impulse and momentum and rigid body motion in engineering problems. (K3)

CO – PO, PSO MAPPING:

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

Recommended by

Board of Studies of CIVIL dept.

Meeting No. 8 Dated: 6/6/24

SEMESTER - II

24HSTA201 - SDG NO. 4	TAMILS AND TECHNOLOGY	L	T	P	CP	C
		1	0	0	1	1

OBJECTIVES:

- Understand the techniques that help for a better livelihood
- Identify the methods used for scientific Tamil computing

அலகு-I நெசவு மற்றும் பானைத் தொழில்நுட்பம்

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

UNIT-I WEAVING AND POTTERY (CERAMIC) TECHNOLOGY

5

Weaving Industry during Sangam Age - Ceramic technology - Black and Red-ware Potteries (BRW) - Graffiti on Potteries.

அலகு -II சங்ககாலவடிவமைப்புகள்

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ஒருசங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்.

UNIT-II SANGAM AGE DESIGNS

5

Designing and Structural construction - House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age- Details of Stage Constructions in Silappathikaram

அலகு -III பழங்காலகட்டிடத் தொழில்நுட்பம்

மாமல்லபுரச்சிற்பங்களும், கோவில்களும் - சோழர்காலத்துப்பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் - நாயக்கர்காலக்கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டுவீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக்கட்டிடக் கலை.

UNIT-III ANCIENT CONSTRUCTION TECHNOLOGY

5

Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses> Indo - Saracenic architecture at Madras during British Period.

அலகு- IV உற்பத்தித் தொழில்நுட்பம்

கப்பல் கட்டும் கலை -உலோகவியல் -இரும்புத் தொழிற்சாலை இரும்பை உருக்குதல், எஃகு - வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் சங்கு மணிகள் -எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

UNIT-IV MANUFACTURING TECHNOLOGY

5

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting> steel - Copper and gold- Coins as source of history - Minting of Coins - Beads making-industries - Stone beads - Glass beads - Terracotta beads - Shell beads/bone beads - Archaeological evidences - Gem stone types described in Silappathikaram.

அலகு - V வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்குழுழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காகவடிவமைக்கப்பட்டகிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள்- கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

UNIT-V AGRICULTURE AND IRRIGATION TECHNOLOGY

5

Dam, Tank, Ponds, Sluice, Significance of KumizhiThoompu of Chola Period> Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conch diving -Ancient Knowledge of Ocean - Knowledge Specific Society.

அலகு-VI அறிவியல்தமிழ்மற்றும் கணித்தமிழ்

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக்கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

UNIT-VI SCIENTIFIC TAMIL & TAMIL COMPUTING

5

Development of Scientific Tamil - Tamil computing - Digitalization of Tamil Books - Development of Tamil Software - Tamil Virtual Academy -Tamil Digital Library - Online Tamil Dictionaries - Sorkuvai Project.

TOTAL: 30 PERIODS**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு — மக்களும் பண்பாடும் — கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2. கணினித் தமிழ் — முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி — வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை — ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian> Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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9. Keeladi - „Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:

Upon completion of the course, the learners will be able to:

1. சங்ககால நெசவு மற்றும் பானைத்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்
To learn about the weaving and pottery (ceramic) technologies during the Sangam Age.(K2)
2. சங்ககாலவடிவமைப்புகள் மற்றும் கட்டுமானக்கலையைப் புரிந்து கொள்ளுதல்
To understand the designs and structural constructions during the Sangam period.(K2)
3. பண்டைய கால கட்டிடக்கலையின் நுட்பங்கள் மற்றும் கட்டிடவடிவமைப்புகளை ஆராய்தல்.
To explore the techniques and architectural patterns of ancient Tamil structures.(K2)
4. உற்பத்தி மற்றும் உலோகவியல்தொழில்நுட்பங்களைப் பற்றி அறிதல்.
To gain knowledge on manufacturing and metallurgical technologies of ancient Tamils.(K3)
5. வேளாண்மை, நீர்ப்பாசனம் மற்றும் கடல்சார்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்.
To understand agricultural> irrigation> and marine technologies of ancient Tamil society.(K3)
6. அறிவியல்தமிழ் மற்றும் கணித்தமிழின் வளர்ச்சியையும் அதன் கணினி பயன்பாடுகளையும் புரிந்து கொள்ளுதல்.
To understand the development of Scientific Tamil and its applications in Tamil computing.(K3)

Recommended by	
Board of Studies of	H&S dept.
Meeting No.	6 Dated: 31/08/2024

S. Narayana
Chairman
Board of Studies
Department of Humanities & Sciences

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01	3	3	2	2	-	-	-	-	-	-	1	2	2
C02	3	3	3	2	-	-	-	-	-	-	1	2	1
C03	3	3	3	3	-	-	-	-	-	-	1	2	1
C04	3	2	3	3	-	-	-	-	-	-	1	2	2
C05	3	3	3	3	-	-	-	-	-	-	1	2	1
C06	3	3	3	3	-	-	-	-	-	-	1	2	2

SEMESTER - II

24HSNC201 - SDG NO. 4	NCC COURSE LEVEL 1					L	T	P	CP	C
						2	0	0	2	0

ARMY WING

NCC GENERAL

6

NCC 1 Aims, Objectives & Organization of NCC

1

NCC 2 Incentives

2

NCC 3 Duties of NCC Cadet

1

NCC 4 NCC Camps: Types & Conduct

2

NATIONAL INTEGRATION AND AWARENESS

4

NI 1 National Integration: Importance & Necessity

1

NI 2 Factors Affecting National Integration

1

NI 3 Unity in Diversity & Role of NCC in Nation Building

1

NI 4 Threats to National Security

1

PERSONALITY DEVELOPMENT

7

PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving

2

PD 2 Communication Skills

3

PD 3 Group Discussion, Stress & Emotions

2

Recommended by
Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/05/2024

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LEADERSHIP	5
L1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L2 Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT 8

SS1 Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS4 Protection of Children and Women Safety	1
SS5 Road / Rail Travel Safety	1
SS6 New Initiatives	2
SS7 Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

NAVAL WING

NCC GENERAL 6

NCC1 Aims, Objectives & Organization of NCC	1
NCC2 Incentives	2
NCC3 Duties of NCC Cadet	1
NCC4 NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS 4

NI1 National Integration: Importance & Necessity	1
NI2 Factors Affecting National Integration	1
NI3 Unity in Diversity & Role of NCC in Nation Building	1
NI4 Threats to National Security	1

PERSONALITY DEVELOPMENT 7

PD1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD2 Communication Skills	3
PD3 Group Discussion: Stress & Emotions	2

LEADERSHIP 5

L1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L2 Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT 8

SS1 Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
---	---

Recommended by
Board of Studies of H&S dept.
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SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
TOTAL: 30 PERIODS		

ARMY WING

NCC GENERAL		6
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS **4**

NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT **7**

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP **5**

L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhansi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT **8**

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

Recommended by
Board of Studies of HAS dept.
Meeting No. 6 Dated: 31/05/2024 | 51 |

S. Narayanaiah
Chairman
Board of Studies
Department of Humanities & Sciences

SEMESTER - II

24ESGE102 SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

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

ELECTRICAL ENGINEERING PRACTICE

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

ELECTRONICS ENGINEERING PRACTICE

- Study of Electronic components and equipment – Resistor- colour coding, measurement of AC signal parameter (peak-peak RMS, period, frequency) using CRO.
- Study of logic gates AND, OR, EX-OR, and NOT.
- Generation of Clock Signal.
- Soldering practice – Components, Devices, and Circuits – Using general purpose PCB.
- Measurement of ripple factor of Half Wave Rectifier and Full Wave Rectifier.
- Simulation of Half Wave Rectifier and Full Wave Rectifier using TinkerCAD.

CIVIL ENGINEERING PRACTICE

Buildings:

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

Recommended by	
Board of Studies of <u>mech</u> dept.	
Meeting No. <u>8</u>	Dated: <u>1.6.24</u>

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

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

MECHANICAL ENGINEERING PRACTICE**Welding:**

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

Basic Machining:

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

Sheet Metal Work:

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

Demonstration on:

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

TOTAL: 60 PERIODS**Recommended by**Board of Studies of Mech dept.Meeting No. 8 Dated: 1.6.24 | 53 |

Beipal Cornall
CHAIRMAN
 Board of Studies
 Mechanical Engineering

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

ELECTRICAL

- | | |
|--|---------|
| 1. Assorted electrical components for house wiring | 15 Sets |
| 2. Electrical measuring instruments | 10 Sets |
| 3. Study purpose items: | |
| Iron box, fan and regulator, emergency lamp | 1 Each |
| 4. Megger (250V/500V) | 1 No |
| 5. Power Tools: | |
| Range Finder | 2 Nos |
| Digital Live-wire detector | 2 Nos |

ELECTRONICS

- | | |
|---|--------|
| 1. Soldering guns | 10 Nos |
| 2. Assorted electronic components for making circuits | 50 Nos |
| 3. Small PCBs | 10 Nos |
| 4. Multimeters | 40 Nos |

CIVIL

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

MECHANICAL

- | | |
|---|--------|
| 1. Arc welding transformer with cables and holders | 5 Nos |
| 2. Arc welding transformer with cables and holders | 5 Nos |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 Nos |

Recommended by
Board of Studies of Mech dept.
Meeting No. 8 Dated: 11-20

- | | |
|--|--------|
| 5. Centre lathe. | 2 Nos |
| 6. Hearth furnace, anvil and smithy tools. | 2 Sets |
| 7. Moulding table, foundry tools. | 2 Sets |
| 8. Power Tool: Angle Grinder. | 2 Nos |
| 9. Study-purpose items: centrifugal pump, air-conditioner. | 1 each |

OUTCOMES:

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

1. Infer the values of resistance, peak to peak RMS values, time period, frequency. [K2]
2. Outline the logic gates, rectifier, timer circuits and soldering practices. [K2]
3. Demonstrate the measurement of electrical parameters such as voltage, current, resistance, power and energy. (K2)
4. Illustrate the residential wiring, staircase wiring and fluorescent lamp wiring. [K2]
5. Prepare the carpentry and plumbing joints. (K2)
6. Perform the basic operations of welding, sheet metal work and basic machining operations in Lathe and Drilling (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	3	-	-	-	-	-	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	-	-	-	-	-	2	2
C04	3	-	-	-	-	-	-	-	-	-	-	2	2
C05	2	-	-	-	-	-	-	-	-	-	-	2	2
C06	2	-	-	-	-	-	-	-	-	-	-	2	2

Recommended by
 Board of Studies of Mech dept.
 Meeting No. 8 Dated: 1.6.24

P. Rajamallu
CHAIRMAN
 Board of Studies
 Mechanical Engineering

SEMESTER - II

24ENTP201 - SDG NO. 4	DIGITAL DYNAMICS	L	T	P	CP	C
		1	0	1	2	0

OBJECTIVES:

- Explore online communication
- Master computer skills
- Use virtual platforms
- Understand digital ethics and cyber security
- Observe and follow do's and don'ts

MODULE - I DIGITAL CULTURE AND SOCIETY**6**

- Adapting to changes
- Importance in today's digital landscape
- Digital identity and self-presentation
- Online communities and forums
- Digital divide and consequences
- Online collaboration and collective action

MODULE - II DIGITAL LITERACY AND ACCESS TO TECHNOLOGY**5**

- Computer skills
- Social and cultural understanding
- Social media campaign and Activism
- Netiquettes
- Trending Technologies
- Digital tools and softwares

MODULE - III DIGITAL ETHICS**3**

- Digital ethics and moral panics
- The art of protecting secrets
- Overview of digital tools

MODULE - IV CYBERSECURITY**3**

- Threats, vulnerability and consequences
- Data making and usage practice
- Importance of security

Recommended by
Board of Studies of H4S dept. | 56 |
Meeting No. 6 Dated: 31/05/2024

S. Namakshahi
Chairman
Board of Studies
Department of Humanities & Sciences

MODULE - V DIGITAL NETWORKING

- Remote work and virtual teams
- Authenticity in digital interactions
- Engaging content creation
- Tools and techniques for insightful usage
- Balancing online and offline interactions
- Collaboration for research and innovation

MODULE - VI BUREAU OF INDIAN STANDARDS (BIS):BASIC CONCEPTS, STANDARDS FORMATION PROCESS AND CHALLENGES

6

Standardization –Basic Concepts:

- Basic concepts of standardization
- Purpose of standardization, marking and certification of articles and processes
- Importance of standards to industry, policy makers, trade, sustainability and innovation

Standards Formulation Process and Challenges:

- Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/ IEC Directives
- WTO Good Practices for Standardization

World of Standards:

- Important Indian and International Standards

TOTAL: 30 PERIODS**REFERENCES:**

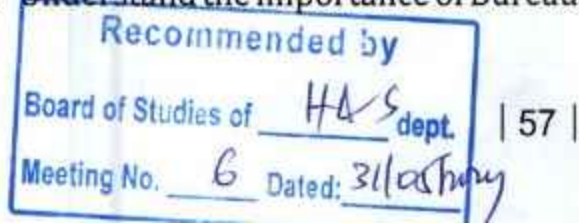
1. Communication Skills and Soft Skills – an Integrated Approach. Edited by E. Sureshkumar, P. Sreehari and J. Savithri, Pearson.
2. Silvia. P.J.2007. How to Read a Lot. Washington DC, American Psychological Association.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. <https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/>

OUTCOMES:**Upon completion of the course, the student will be able to:**

1. Apply online communication techniques and collaboration skills (K3)
2. Enumerate the principles of digital ethics in online interactions (K2)
3. Understand the importance of Bureau of Indian Standards (BIS). (K2)



CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	-	-	-	-	-	-	-	-	3	-	2	-	-
CO3	-	-	-	-	-	-	-	3	2	-	2	-	-

SEMESTER - II

24ESID201 SDG NO. 1-17	IDEA ENGINEERING LAB - II	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

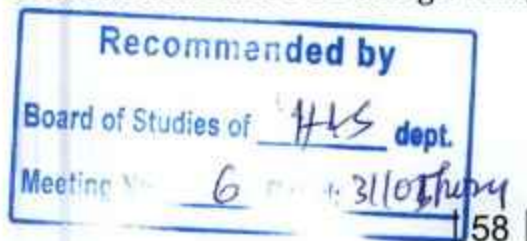
To impart the basics of technologies that are used to identify sustainable solutions to societal problems

- To Provide awareness on Printed Circuit Board (PCB) design using ORCAD software.
- To Raise awareness of at least three Internet of Things (IoT) projects and their applications.
- To Upskill learners through practical experience with 3D printing and scanning technologies.
- To prepare the learners to correctly align the ideas to SDGs
- To comprehensive knowledge on entrepreneurship and effective idea presentation techniques.
- To evaluate the effectiveness of SDGs and implementation strategy

MODULE-1 BASICS OF DESIGN THINKING IN ELECTRICAL AND ELECTRONIC COMPONENTS

4

- Awareness Session on Basics of Design Thinking
- Study of Active & Passive Electronic Components
- Study of Basic AC & DC Electrical Circuits
- Study of Microprocessors & Microcontrollers
- Demonstration of Arduino Board, ESP 32 Board ,Raspberry Pi Board & PCB design software-Eagle
- Demonstration of PCB design using the software's Orcad, Eagle etc.



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MODULE-2 EMBEDDED SYSTEMS, IOT AND ROBOTICS 4

- Study of sensors and transducers
- Study of embedded protocols, IOT Protocols & Embedded C
- Demonstration of Robotics & Drone models

MODULE-3 BASICS OF MECHANICAL ENGINEERING 4

- Study of Mechanical Modeling using Fusion 360
- Demonstration of 3D Scanner, 3D Printer, Laser Cutter & RD Works Software
- Study of Slicer Software & Master Cam Software

MODULE 4 ALIGNMENT AND MAPPING OF IDEAS 4

- **Project Title:** Justification of SDG and SAP - Problem Statement & Solution

MODULE-5 ENTREPRENEURSHIP SKILLS 4

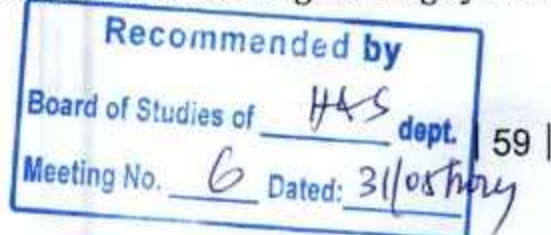
- Startup Awareness
- Entrepreneurship Opportunities
- Mock Presentations
- Innovation
- Novelty
- Feasibility
- Presentation Skills

MODULE-6 SCOUT for SDG IDEATHON 12**Evaluation Stages:**

- First Round
- Second Round
- Idea Pitching

TOTAL: 30 PERIODS**REFERENCES:**

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
3. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
4. Basic Mechanical Engineering by Pravin Kumar, Pearson Education



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- Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
- R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi, 4th Reprint, 2017.
- John J. Craig, Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.

WEB REFERENCES

- https://onlinecourses.nptel.ac.in/noc24_ee112/preview
- https://onlinecourses.nptel.ac.in/noc24_cs115/preview
- https://onlinecourses.nptel.ac.in/noc24_me104/preview
- https://onlinecourses.nptel.ac.in/noc24_me88/preview

OUTCOMES:

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

- Gain the knowledge on Basic Electronics & Electrical Circuits (K2)
- Understand the Basics of Embedded systems, IOT & Robotics (K1)
- Explore the Basics of Mechanical Modeling (K2)
- Interpret the mapping of SDGs to ideas. (K4)
- Illustrate the ideas in the Ideathon event emphatically. (K4)

CO-PO, PSO MAPPING:

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

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Meeting No. 6 Date: 31/05/2024

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SEMESTER - III

24BSMA302 SDG NO. 4	LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- The aim of this course is to impart knowledge in the concepts of linear algebra as a prerequisite for the recent thrust areas of technological advancement.
- To know the importance of partial differential equations in modelling various engineering problems.

MODULE -I VECTOR SPACES

9

Vectors and Linear combinations-Vector spaces (Definitions and examples) - Subspaces (Definitions and examples) - Linear independence and linear dependence - Bases and dimensions.

MODULE -II LINEAR TRANSFORMATION

12

Linear transformation - Null and range spaces - Dimension theorem (Statement only) - Matrix of a linear transformation

MODULE - III INNER PRODUCT SPACES

9

Inner product - Norm - Gram Schmidt orthogonalization process (Statement only) - QR decomposition.

MODULE - IV ADJOINT OPERATORS

9

Adjoint of a linear operator - Least square approximation- Normal and self-adjoint operators.

MODULE - V SOLUTIONS OF FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS

12

Solutions of standard types of first order partial differential equations - Singular integral - Complete integral - Lagrange's linear equation.

MODULE - VI SOLUTIONS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS

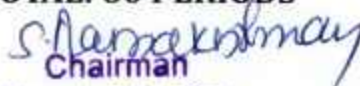
9

Linear homogeneous and non-homogeneous partial differential equations of second and higher order with constant coefficients.

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Meeting No.	6 Dated: 31/08/2024

| 61 |

TOTAL: 60 PERIODS


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TEXT BOOKS:

1. Linear Algebra, Friedberg A.H., Insel A.J. and Spence L., 4th Edition, Pearson, 2018.
2. Transforms and Partial Differential Equation, Veerarajan T., 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2016.

REFERENCES:

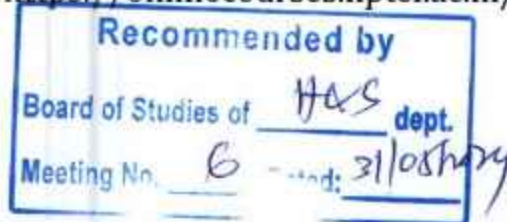
1. Linear Algebra and its applications, Strang G., 4th Edition, Thomson (Brooks/Cole), New Delhi, 2005.
2. Linear Algebra and its Applications, Lay D. C., 5th Edition, Pearson Education, 2015.
3. Linear Algebra – A Geometric Approach, Kumaresan S., 1st Edition, Prentice Hall of India, New Delhi, Reprint, 2010.
4. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
5. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, Reprint, Laxmi Publications, 2008.
6. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.

WEB RESOURCES

1. <https://theengineeringmaths.com/wp-content/uploads/2016/02/Partial-differential-equations.pdf>
2. <https://www.math.hkust.edu.hk/~mabfchen/Math111/Week7-9.pdf>
3. <https://math.mit.edu/~sschiavo/18-700/Lectures/LessonPlan17.pdf>

ONLINE RESOURCES:

1. <https://www.khanacademy.org/math/linear-algebra>
2. https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/video_galleries/video-lectures/
3. <https://nptel.ac.in/courses/111106135>
4. https://onlinecourses.nptel.ac.in/noc25_ma111/preview



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COURSE OUTCOMES

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

1. Determine the bases and dimension of vector spaces and subspaces. (K3)
2. Analyse the matrix of a linear transformation for its rank and nullity. (K4)
3. Construct an orthonormal basis using Gram-Schmidt orthogonalization process and use it for QR decomposition of a matrix. (K3)
4. Determine the adjoint of a linear operator and solve least squares approximation problems. (K3)
5. Classify the solutions of first order partial differential equations including Lagrange's linear equation. (K4)
6. Solve linear homogeneous and non-homogeneous partial differential equations of second and higher order with constant coefficients. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	-	3	-	-	-	-	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	-	-	-	-	-	2	2
C04	3	-	-	-	-	-	-	-	-	-	-	2	3
C05	-	3	-	-	-	-	-	-	-	-	-	3	3
C06	3	-	-	-	-	-	-	-	-	-	-	3	3

SEMESTER - III

24CEPC301 105104160 SDG NO. 4, 9	SOLID MECHANICS					L	T	P	CP	C
						3	0	0	3	3

OBJECTIVES:

- Understand basic concepts of stress, strain, and deformation.
- Analyze shear force and bending moment in beams.
- Evaluate forces in determinate and indeterminate trusses.
- Solve indeterminate beams using appropriate methods.
- Apply column and cylinder stress theories.
- Interpret 3D stress states and failure theories.

Recommended by
Board of Studies of CIVIL dept.

Meeting No. 9 Dated: 4/9/25

MODULE - I STRESS, STRAIN AND DEFORMATION OF SOLIDS 7

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

MODULE - II TRANSFER OF LOADS AND STRESSES IN BEAMS 8

Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams.

MODULE - III ANALYSIS OF TRUSSES 7

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

MODULE - IV INDETERMINATE BEAMS 8

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

MODULE - V COLUMNS AND CYLINDERS 7

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

MODULE - VI STATE OF STRESS IN THREE DIMENSIONS 8

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

TOTAL : 45 PERIODS

Recommended by

Board of Studies of CIVIL dept.

Meeting No. 9 Dated: 4/3/25

TEXT BOOKS:

1. Beer, F.P. & Johnston.E.R."Mechanics of Materials", Tata McGraw Hill, Sixth Edition, New Delhi 2010.
2. M. L. Gambhir , "Fundamentals of Solid Mechanics - A Treatise on Strength of Materials" , Phi Learning 2009
3. R.C Hibbeler, "Mechanics of Materials", Prentice-Hall, New Delhi. 2022.
4. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2018.

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2017
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series,Tata McGraw Hill Publishing company, 2017.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2021
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., NewDelhi, 2015
5. Irwing H.Shames, James M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002
6. James M.Gere., Mechanics of Materials, Thomas Canada Ltd., Canada, 2006.

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/112/106/112106286/>
2. <https://nptel.ac.in/courses/112/103/112103108/>
3. <https://nptel.ac.in/courses/112/106/112106180/>

WEB REFERENCES:

1. <https://www.ndl.gov.in/>
2. http://www.brainkart.com/subject/Strength-of-Materials_75/
3. https://en.wikibooks.org/wiki/Strength_of_Materials

OUTCOMES

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

1. Understand and apply the concepts of stress, strain, principal stresses, and principal planes in materials under different loading conditions. (K3)
2. Determine and draw shear force and bending moment diagrams, and calculate stress distribution in various types of beams. (K3)

Recommended by

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Meeting No. 9 Dated: 4/3/25

- Analyze pin-jointed plane and space trusses to find forces in members under given loads. (K3)
- Calculate the load-bearing capacity of columns, and analyze stresses in thin and thick cylinders as well as spherical shells. (K3)
- Identify principal stresses in complex loading scenarios and apply suitable failure theories to assess material safety. (K3)
- Analyze complex stress conditions using principal stress and failure theories to predict material behavior and failure. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	0	0	0	0	0	0	0	0	1	1	2
C02	3	3	2	0	2	0	0	0	0	0	1	2	2
C03	2	3	2	0	1	0	0	1	0	0	0	2	2
C04	2	2	1	0	1	2	0	0	0	0	1	2	2
C05	3	3	2	1	2	1	1	0	0	0	2	2	3
C06	3	3	2	1	2	1	1	0	0	0	2	2	3

SEMESTER - III

24CEPC302	FLUID MECHANICS AND HYDRAULIC ENGINEERING	L	T	P	CP	C
SDG NO. 4,9&15		3	0	0	3	3

OBJECTIVES:

- To understand the Fundamentals of properties of fluids and their role in fluid statics.
- To study the principles of kinematics, hydrodynamics, and its applications.
- To analyze laminar and viscous flows in pipes and calculate energy losses.
- To understand the principles of open channels and energy concepts.
- To learn the equation of GVF and RVE, flow profile and concept of energy dissipation.
- To explore the working principles of hydraulic turbines and pumps.

MODULE -I FLUIDS PROPERTIES AND FLUID STATICS**7**

PROPERTIES OF FLUIDS – Density, specific weight, specific gravity, viscosity, surface tension, capillarity, and compressibility

Recommended byBoard of Studies of CIVIL dept.Meeting No. 9 Dated: 4/3/25

FLUID STATICS – Pressure: static, absolute, and gauge pressure; forces on plane and curved surfaces

MODULE - II FLUID KINEMATICS & DYNAMICS

7

FLUID KINEMATICS - Classification of flows-Stream line, streak-line and path-lines, Stream function and velocity potentials- Flow net.

FLUID DYNAMICS - Equation of motion, Euler's and Bernoulli's equations derivations, Applications of Bernoulli's equations: Venturimeter, Orifice meter and Pitot tube, Momentum equation.

MODULE - III LAMINAR AND VISCOUS FLOW

7

Laminar flow in pipes and between parallel plates -Darcy-Weisbach equation-Moody diagram, Flow through pipes -Major and minor losses of energy in pipes, hydraulic gradient, total energy line, pipes in series, pipes in parallel, -Equivalent pipes, and hydraulic transmission of power.

MODULE - IV UNIFORM FLOW

8

Definition and differences between pipe flow and open channel flow -Types of Flow - Properties of open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Specific energy and specific force - Critical flow.

MODULE - V GRADUALLY AND RAPIDLY VARIED FLOWS

8

GRADUALLY VARIED FLOW- Dynamic equations of gradually varied - Water surface flow profile classifications- Profile determination by Numerical method: Direct step method and Standard step Method - Change in Grades.

RAPIDLY VARIED FLOW- Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Celerity - Rapidly varied unsteady flows (positive and negative surges)

MODULE - VI TURBINES AND PUMPS

8

TURBINES -Classification of Turbines - Pelton wheel - Francis turbine - Kaplan turbine- Specific speed -Characteristic Curves of Turbines,

PUMPS- Classification of Pumps - Centrifugal pumps - Minimum speed to start the pump - NPSH - Multistage pumps - Characteristics curve - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Field visit to hydraulic research station and urban drainage systems.

TOTAL : 45 PERIODS

Recommended by

Board of Studies of CIVIL dept.

Meeting No. 9 Dated: 4/3/25

TEXT BOOKS:

1. P.N. Modi and S.M. Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House, New Delhi
2. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGraw-Hill, New Delhi.
3. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi.
4. Robert W. Fox, Alan T. McDonald, Philip J. Pirtchard John W. Mitchell, Introduction to Fluid Mechanics, 9th Edition, Wiley Publications, 2015.

REFERENCE BOOKS:

1. Jain A.K. "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 2014.
2. Narayana Pillai N. "Principles of Fluid Mechanics and Fluid Machines", (3rd.Ed.) University Press(India) Pvt.Ltd.2009.
3. Mays L.W., Water Resources Engineering, John Wiley and Sons (WSE), New York, 2005.
4. VenTe Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.
5. Subramanya K, Flow in open channels, Tata Mc Graw Hill, New Delhi, 2000.

ONLINE RESOURCES:

1. <https://www.edx.org/learn/fluid-mechanics>
2. <https://staging.capabilitydevelopment.org/Coursedesc/FLUID-MECHANICS>
3. <https://www.udemy.com/course/open-channel-hydraulics/>
4. <https://www.udemy.com/course/fluid-mechanics-udemy/>

WEB REFERENCES:

1. <https://archive.nptel.ac.in/courses/105/103/105103095/>
2. <https://archive.nptel.ac.in/courses/105/105/105105203/>
3. <https://www.slideshare.net/slideshow/r-k-bansal-a-textbook-of-fluid-mechanics-and-hydraulic-machines-9laxmipdf/255316731>
4. <https://civil.aitmbgm.ac.in/wp-content/uploads/2023/01/Fluid-Mechanics-Fluid-Machines.pdf>

Recommended byBoard of Studies of CIVIL dept.Meeting No. 9 Dated: 4/3/25

OUTCOMES

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

1. Apply fluid properties and the principles of fluid statics to determine forces acting on plane and curved surfaces. (K3)
2. Apply concept of different types of fluid flow using streamlines, flow nets, and dynamic equations for flow measurement applications. (K3)
3. Apply laminar and turbulent flow equations to compute head losses and design efficient piping systems. (K3)
4. Solve uniform flow problems in open channels using Manning's and Chezy's equations to determine flow parameters and optimal hydraulic sections. (K3)
5. Identify gradually and rapidly varied flows in open channels using water surface profiles and momentum-based methods. (K3)
6. Demonstrate the performance and efficiency of turbines and pumps using characteristic curves and operational parameters. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	0	0	0	0	0	0	0	0	1	3	1
CO2	3	2	0	0	0	0	0	0	0	0	1	3	2
CO3	3	2	3	0	2	0	0	0	0	0	1	3	1
CO4	3	2	3	0	2	0	0	0	0	0	1	2	2
CO5	3	2	2	0	2	0	0	0	0	0	1	2	2
CO6	3	2	3	0	2	0	0	0	0	0	1	3	2

SEMESTER - III

24CEPC303 - SDG NO. 4, 9	SURVEYING	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- Understand basic principles and methods of traditional surveying.
- Learn levelling techniques and contour mapping.
- Use theodolites and tachometers for angle and distance measurements.
- Apply control surveying and error adjustment methods.
- Use modern instruments like Total Stations and GPS.
- Explore applications in route, hydrographic and astronomical surveying.

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Meeting No. 9 Dated: 4/3/25

MODULE - I FUNDAMENTALS OF SURVEYING**7**

Classifications and basic principles of surveying – Equipment and accessories for ranging and chaining – Basic principles Compass surveying- Local attraction - Plane Table Surveying accessories and methods.

MODULE - II LEVELLING AND ITS APPLICATION**8**

Levels and staves - Methods of levelling - Booking - Reduction – Curvature and refraction correction - Contouring – Characteristics of contours – Methods of contouring – Interpolation of contours - Contour gradient – Uses of contour plan and map

MODULE - III THEODOLITE SURVEYING AND COMPUTATIONS**8**

Horizontal and vertical angle measurements by Theodolite – Heights and distances - Trigonometric levelling - single and reciprocal observations - Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying.

MODULE - IV CONTROL SURVEYING AND ADJUSTMENT**8**

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

MODULE - V MODERN SURVEYING**7**

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

MODULE - VI MISCELLANEOUS SURVEYING**7**

Route Surveying - Reconnaissance - Route surveys for highways, railways and waterways - Simple curves – Compound and reverse curves – Transition curves - Setting out different methods of simple curve - Vertical curves - Hydrographic surveying – Tides - MSL - Sounding methods - Three-point problem – Tides - MSL - Sounding methods – Fundamental of Astronomical surveying

Recommended byBoard of Studies of CIVIL dept.Meeting No. 9 Dated: 4/3/25**TOTAL : 45 PERIODS**

TEXT BOOKS:

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2016.

REFERENCES:

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
3. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice Hall of India 2004
4. K.R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition. 2013.
5. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105/104/105104101/>
2. <https://nptel.ac.in/courses/105/107/105107122/>

WEB REFERENCES:

1. <https://www.britannica.com/technology/surveying>
2. <http://egyankosh.ac.in/handle/123456789/39480>
3. <https://www.isro.gov.in/spacecraft/satellite-navigation>

OUTCOMES

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

1. Calculate the direct and indirect measurements in conventional surveying such as chain surveying, compass surveying and plane table surveying. (K3)
2. Apply the knowledge of Levelling in the fieldwork and contour map. (K3)
3. Apply the concepts of Theodolite Surveying, Tacheometric surveying and Trigonometrical Levelling in field observations and computations (K3)
4. Solve the errors occurring in field observations by using various methods like normal equations, method of correlates and least squares. (K3)
5. Demonstrate the knowledge on Modern Surveying such as Total station and GPS in the field work (K3)
6. Determine the measurement of elements in Route surveying. Hydrographic surveying, Curve surveying. (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24CEPC304 - SDG NO. 4,9,11	SUSTAINABLE CONSTRUCTION MATERIALS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To explore the properties of common construction materials and how they relate to sustainability, including their embodied energy, durability, and potential for reuse.
- To learn the availability, classifications, manufacturing, tests, properties and uses of conventional and sustainable construction materials
- To learn about different types of sustainable materials and how to select the appropriate materials
- To learn the importance of considering the entire life cycle of a building, from material extraction to demolition and disposal, and how to minimize environmental impacts at each stage
- To learn about green building certifications like LEED, GRIHA, and others, and how they can be used to assess and improve the sustainability performance of buildings
- To learn the alternative construction materials developed and promoted by various government and non-government organizations

MODULE -I INTRODUCTION TO CONCEPTS OF SUSTAINABILITY 8

Introduction to concepts of sustainability: impacts of global warming, sustainability indicators- Carbon footprint, Embodied energy and carbon, sustainability analysis - Life Cycle Analysis, Concept of Green Buildings, Green building rating systems.

Recommended by

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MODULE - II CONVENTIONAL MATERIALS STONES-BRICKS - CONCRETE BLOCKS - LIME **8**

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

MODULE - III CONVENTIONAL MATERIALS CEMENT-AGGREGATE- CONCRETE **9**

Cement - Ingredients - Manufacturing process - Types and grades - Properties of cement and Cement mortar- Tests on Cement - Fineness - Soundness, Consistency - Setting time - Coarse Aggregate - Crushing strength - Impact strength - Flakiness Index - Elongation Index - Abrasion resistance Grading - Fine aggregate - grading - Bulking. Concrete - Ingredients -Manufacturing-Hydration-- Properties of fresh concrete - Slump, Flow and Compaction factor - Properties of Hardened concrete - Compressive, Tensile and Shear strength Modulus of rupture tests.

MODULE - IV SUSTAINABLE BUILDING MATERIALS I **6**

Introduction to sustainable building materials, qualities, use, examples - Natural building materials, locally available and locally manufactured materials -wood, earth, stone and lime based materials. concrete eco block, stabilized blocks, Fal-G Blocks, prefabs / structural insulating panels, cellulose insulation, adobe, rammed earth.

MODULE - V SUSTAINABLE BUILDING MATERIALS II **6**

Bio materials from industrial waste, mining waste, mineral waste, agricultural waste - Use of waste materials such as paper, glass bottles, tires, shipping containers - Use of post-consumer and industrial waste such as fly-ash, bags, building construction & demolition waste - use of salvaged and recycled materials from flooring, columns, beams, timber, glass, etc

MODULE - VI ALTERNATIVE BUILDING MATERIALS **8**

Overview and definition of alternative or appropriate building materials - Alternative materials developed and promoted by government organizations like CSIR labs: CBRI and SERC, GRIHA, ASTRA (IISc), BMTPC, HUDCO and its building centers-Case studies -Alternative materials developed and promoted by non-government organizations DA, Auroville, TERI.

TOTAL : 45 PERIODS

Recommended by
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Meeting No. 9 Dated: 4/3/25

TEXT BOOKS:

1. Er.R.K.Rajput ,Engineering materials, S chand & Company,2000
2. Sustainable Building - Design Manual Pt 1 & 2, The Energy and Resources Institute, TERI, 2004.
3. Ross Spiegel.G, Green Building Materials A Guide to Product Selection and Specification,3rd Edition by, John Wiley & Sons, 2010.

REFERENCE BOOKS:

1. Jagadish. K.S. Alternative Building Materials and Technologies, New age International PvtLtd Publishers, 2008.
2. Traci Rose Rider, Stacy Glass, Jessica McNaughton, Understanding Green BuildingMaterials, W.W.Norton andCompany, 2011
3. BIS, National Building Code 2005, New Delhi, 2005.
4. Energy Conservation Building Code of India, User manual, 2007
5. Jagadish. K.S. Building with stabilised mud,I.K. International Publishing House Pvt.Limited, 2007

ONLINE RESOURCES:

1. <http://www.infocobuild.com/education>
2. [https://freevideolectures.com/course/3516/modern-construction materials](https://freevideolectures.com/course/3516/modern-construction-materials)

WEB REFERENCES:

1. https://onlinecourses.swayam2.ac.in/arp19_ap75/preview
2. <https://archive.nptel.ac.in/courses/105/102/105102195/>
3. <https://nptel.ac.in/courses/105102088/>
4. https://swayam.gov.in/nd1_noc20_ce01/preview

OUTCOMES

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

1. Develop the concepts of sustainability including global warming, Carbon footprint, and Life Cycle Analysis related to construction materials. [K3]
2. Illustrate the origin, classifications, manufacturing and different tests on stones, bricks, lime and concrete hollow blocks. [K3]
3. Interpret the ingredients, manufacturing process, types, properties and tests of cement, aggregates and concrete. [K3]
4. Summarize the availability, qualities and properties of sustainable building materials, including Natural building materials, locally available and locally manufactured materials. [K3]

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- Describe the availability, qualities and properties of Bio materials from industrial waste and post-consumer industrial waste materials. [K3]
- Explain the alternative construction materials developed and promoted by various government and non-government organizations. [K3]

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	1	-	-	3	-	-	-	-	2	3	2
C02	2	2	1	-	2	1	-	-	-	-	1	2	-
C03	2	2	2	-	3	1	-	-	-	-	1	3	1
C04	2	3	3	-	2	3	-	-	-	-	2	3	2
C05	2	2	2	-	2	3	-	-	-	-	1	2	2
C06	2	2	3	-	2	3	-	-	-	-	2	2	2

SEMESTER - III

24HSMC301	UNIVERSAL HUMAN VALUES – II UNDERSTANDING HARMONY	L	T	P	CP	C
SDG NO. 4 & 9		3	0	0	3	3

OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Developing clarity with harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.
- Recognizing the potential of excellence than competition

SYLLABUS:

The course has 28 lectures and 14 practice sessions in 6 modules:

**MODULE - I COURSE INTRODUCTION - NEED, BASIC GUIDELINES,
CONTENT AND PROCESS FOR VALUE EDUCATION (5+2)**

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration

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3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

MODULE -II UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF (5+2)

6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

MODULE -III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY HARMONY IN HUMAN-HUMAN RELATIONSHIP (6+2)

12. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
13. Understanding the meaning of Trust; Difference between intention and competence
14. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

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15. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

MODULE - IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE (6+2)

16. Understanding the harmony in the Nature
17. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
18. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
19. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

MODULE - V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS (4+4)

20. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family
21. Natural acceptance of human values
22. Definitiveness of Ethical Human Conduct
23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
24. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

MODULE - VI UNIVERSAL HUMAN ORDER (4+3)

25. Programs to ensure Sanyam and Health
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc

TOTAL : 45 PERIODS

TEXT BOOKS:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 3rd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.

REFERENCES:

1. AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj- Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda- Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

OUTCOMES

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

1. Express the harmony of relationship among human being, family, society, nature and existence with right understanding and right feeling. (K2)
2. Develop the responsibility of handling problems by finding holistic and sustainable solutions based on the natural acceptance for maintaining mutual human relationships. (K2)
3. Develop a holistic perspective of life based on self-exploration about self, family, society and nature/existence. (K2)
4. Elucidate a critical ability for dedicative commitment towards human values, relationships and society. (K2)

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5. Implement the process of verification and validation of learning in daily life. (K2)
6. Develop self reflection, commitment and courage to act in life challenging situations. (K2)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	-	-	-	-	-	3	3	2	-	-	3
C02	-	1	-	-	-	3	3	2	-	-	-
C03	-	-	3	-	-	3	3	2	-	-	-
C04	-	-	-	-	-	3	3	2	-	2	3
C05	-	-	-	-	-	3	3	-	-	-	3
C06	-	-	-	-	-	3	3	-	-	3	2

SEMESTER - III

24HSNC301	NCC COURSE LEVEL 2					L	T	P	CP	C
SDG NO. 4						3	0	0	3	0

ARMY WING**PERSONALITY DEVELOPMENT****9**

PD 3 Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5 Public Speaking 3

LEADERSHIP**7**

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT**13**

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3

DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters 9

DM 3 Fire Service & Fire Fighting 1

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Meeting No. 6 Date: 31/05/2024

ENVIRONMENTAL AWARENESS & CONSERVATION	3
EA 1 Environmental Awareness and Conservation	3
GENERAL AWARENESS	4
GA 1 General Knowledge	4
ARMED FORCES 6	
AF 1 Armed Forces, Army, CAPF, Police	6
ADVENTURE 1	
AD 1 Introduction to Adventure Activities	1
BORDER & COASTAL AREAS	2
BCA 1 History, Geography & Topography of Border/Coastal areas	2
TOTAL: 45 PERIODS	

NAVAL WING

PERSONALITY DEVELOPMENT	9
PD 3 Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5 Public Speaking	3

LEADERSHIP 7

L 2 Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
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DISASTER MANAGEMENT 13

DM 1 Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2 Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3 Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1 Environmental Awareness and Conservation	3
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GENERAL AWARENESS 4

GA 1 General Knowledge	4
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Board of Studies of	HAS dept.
Meeting No.	6
Dated:	31/08/2024

NAVAL ORIENTATION 6

AF 1	Armed Forces and Navy Capsule	3
EEZ 1	EEZ Maritime Security and ICG	3

ADVENTURE 1

AD 1	Introduction to Adventure Activities	1
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BORDER & COASTAL AREAS 2

BCA 1	History, Geography & Topography of Border/Coastal areas	2
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TOTAL: 45 PERIODS**AIR FORCE WING****PERSONALITY DEVELOPMENT 9**

PD 3	Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5	Public Speaking	3

LEADERSHIP 7

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
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DISASTER MANAGEMENT 13

DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1	Environmental Awareness and Conservation	3
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GENERAL AWARENESS 4

GA 1	General Knowledge	4
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GENERAL SERVICE KNOWLEDGE 6

GSK 1	Armed Forces & IAF Capsule	2
GSK 2	Modes of Entry in IAF, Civil Aviation	2
GSK 3	Aircrafts - Types, Capabilities & Role	2

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ADVENTURE 1

AD 1 Introduction to Adventure Activities 1

BORDER & COASTAL AREAS 2

BCA 1 History, Geography & Topography of Border/Coastal areas 2

TOTAL :45 PERIODS**SEMESTER - III**

24CEPT301 - SDG NO. 4, 9	COMPUTER AIDED BUILDING DRAWING LAB WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

- To understand the principles of building planning, orientation, and design of functional units in buildings.
- To learn the architectural detailing of doors, windows, and roofs as per building standards.
- To acquire skills in drafting building plans, elevations, and sections using Computer-Aided Design (CAD) software.
- To study industrial building design, including north light roof trusses.
- To understand the fundamentals of Building Information Modeling (BIM).
- To interpret and detail reinforcement drawings of RCC structural elements and footings.

MODULE -I PRINCIPLES OF PLANNING AND ORIENTATION 10

Principles of building planning – Aspect, Prospect, Grouping, Circulation, Privacy, Elegance, Roominess, Sanitation, Flexibility, Economy. Orientation of buildings with respect to Sun, Wind, and Site conditions. Study of building bye-laws, plot coverage, FSI, setbacks, and ventilation. Design and detailing of panelled and glazed doors and windows as per IS codes.

LIST OF EXPERIMENTS

1. Principles of planning and orientation(Panelled and Glazed doors and window)

MODULE -II RESIDENTIAL BUILDING DRAWINGS (LOAD BEARING & RCC ROOF) 10

Functional planning of residential buildings (single and double storey). Drawing plans and section for buildings with load bearing walls. RCC

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slab and beam roof details. Plumbing and electrical layout introduction. Drafting residential drawings using AutoCAD.

LIST OF EXPERIMENTS

1. Buildings with load bearing walls and RCC roof (Plan, section, elevation)

MODULE - III BUILDINGS WITH SLOPING ROOFS

10

Types of sloping roofs – lean-to, gable, hipped, and combined. Constructional details of sloping roofs using timber and steel trusses. Preparation of plan, elevation, and section for sloping roof structures. Introduction to drafting 3D views and rendering in CAD.

LIST OF EXPERIMENTS

1. Buildings with sloping roof

MODULE - IV INDUSTRIAL BUILDINGS

10

Functional requirements of industrial buildings. Components: column, truss, purlin, bracing, north light roof truss. Preparation of plan, elevation, and sectional details of industrial sheds. Layout planning of industrial buildings using CAD.

LIST OF EXPERIMENTS

1. Industrial buildings – North light roof truss

MODULE - V BUILDING INFORMATION MODELING (BIM)

10

Introduction to BIM – concept, advantages over CAD. BIM software tools: Revit, ArchiCAD, etc. Creating and editing building elements – walls, floors, roofs, doors, windows. Generating 3D models, schedules, and documentation. Introduction to rendering and walkthroughs.

LIST OF EXPERIMENTS (STUDY)

1. Building information modeling.

MODULE - VI REINFORCEMENT DETAILING

10

General principles of detailing as per IS 456:2000. Reinforcement detailing of RCC beam, slab, and column. Reinforcement detailing of isolated and combined footings. Study of structural drawing conventions and bar bending schedules.

LIST OF EXPERIMENTS (STUDY)

1. Reinforcement detailing of RCC Structural elements-study (Beam, slab, column)study
2. Reinforcement detailing of Footing (Isolated and combined footing)-study

TOTAL: 60 PERIODS

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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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

OUTCOMES

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

1. Apply the principles of planning and orientation in building design. (K3)
2. Prepare architectural and structural drawings of residential buildings using AutoCAD or equivalent software. (K4)
3. Prepare architectural and structural drawings of industrial buildings using AutoCAD or equivalent software. (K4)
4. Illustrate and detail doors, windows, and roof structures. (K3)
5. Create BIM models of buildings using software. (K3)
6. Read and prepare reinforcement detailing drawings for RCC elements and footings. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	2	0	1	1	0	0	1	1	1	3	1
CO2	2	1	3	1	2	0	0	1	2	2	1	2	1
CO3	2	2	3	1	2	1	0	1	2	2	1	3	1
CO4	2	2	3	2	2	1	1	1	2	1	2	3	2
CO5	2	2	3	1	2	1	0	1	2	2	1	3	1
CO6	2	2	3	2	2	1	1	1	2	1	2	3	2

SEMESTER - III

24CEPL301 - SDG NO. 4, 9	SURVEYING LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- Develop proficiency in using surveying instruments for accurate measurements.
- Correct surveying errors through techniques like local attraction adjustment and levelling.

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- Gain exposure to modern tools like Total Station for data collection and mapping.
- Apply tacheometric methods for measuring heights, distances, and elevations.

LIST OF EXPERIMENTS

1. Determination of distance between two points by ranging and chaining
2. Determination of area of a field by Cross staff survey
3. Compass traversing - Computation of Included angle after adjustment of Local Attraction
4. Planimetric mapping of an area using Plane table surveying (Radiation, Intersection)
5. Fly leveling using dumpy level.
6. Check Leveling.
7. Horizontal angle observations by Repetition and Reiteration methods
8. Vertical angle observation using Theodolite surveying.
9. Determination of elevation of an object using single plane method when base is accessible /inaccessible.
10. Determination of Tacheometric Constants
11. Heights and distances by Stadia & Tangential Tacheometry.
12. Study of Total Station

TOTAL: 60 PERIODS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

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

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OUTCOMES

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

1. Demonstrate proficiency in using conventional surveying instruments such as chains, tapes, compasses, and plane tables for civil engineering applications. (K3)
2. Apply levelling techniques to accurately determine the reduced levels of various points in civil engineering projects. (K3)
3. Compute heights and distances through the use of horizontal and vertical angle measurements with Theodolite and Tacheometric surveying methods. (K3)
4. Gain hands-on experience with modern surveying tools like the Total Station, enhancing field data collection and mapping skills. (K3)

CO – PO, PSO MAPPING:

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

SEMESTER - III

24CETP301 - SDG NO. 4	APTITUDE SKILLS - I	L	T	P	CP	C
		0	0	2	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1**OBJECTIVES:**

- Enrich students on quantitative ability, reasoning ability, and verbal ability
- Build a strong foundation for solving recruitment-based problems with speed and accuracy.
- Enhance creative thinking skills and Strengthen problem-solving skills.

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MODULE - I QUANTITATIVE ABILITY**22**

- Number Properties, Speed Math, HCF and LCM, Percentages, Time and Work, Time Speed and Distance, Ratio Proportion and Variations, Averages Mixtures and Alligation

MODULE - II QUANTITATIVE ABILITY REASONING ABILITY**16**

- Profit and Loss, Simple Interest and Compound Interest, Blood Relation, Directions, Coding and Decoding, Series, Ranking and Arrangements

MODULE - III VERBAL ABILITY**7**

- Subject-Verb Agreement, Tenses, Prepositions - Concepts, Error Spotting, Sentence Correction, Fill in the Blanks

TOTAL: 45 PERIODS**REFERENCES:**

1. Quantitative Aptitude for Competitive Examinations – R.S. Aggarwal
2. A Modern Approach to Logical Reasoning – R.S. Aggarwal
3. High School English Grammar & Composition – Wren & Martin
4. Word Power Made Easy – Norman Lewis.
5. Fast Track Objective Arithmetic – Rajesh Verma

LIFE SKILLS, RANGER AND ROVER & BIS STANDARDS – PHASE 2**OBJECTIVES:**

- Familiarize the team and leadership skills.
- Gain Scouting spirit.
- Understand the standards relevant to CIVIL.

MODULE - I JEEVAN KAUSHAL 2.0 – TEAM SKILLS AND LIFE SKILLS 12

Trust and Collaboration: Importance of Trust in Creating a Collaborative Team- Agree to Disagree and Disagree to Agree – Spirit of Teamwork - Understanding Fear of Being Judged and Strategies to Overcome.

Brainstorming: Basics and the process – Effective technique for ideation – Types – Importance and Benefits

Internal Communication: Internal Communication – Meaning and the Need, Use of Various Channels for Transmitting Information to Team Members including Digital and Physical.

Leadership Skills: Leadership concept - Leadership skills – Leadership moralities – Leadership models

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MODULE - II RANGER AND ROVER**10**

Four Bonds of BSG: Sign, Salute, Left Handshake, Moto and Good Turn.

Discipline and Uniform: Uniform of Rovers and Rangers, 14 Programme ideals.

Knowledge of Merit: Know about Knowledge of Merit Badges (Proficiency Badge).

Sustainability E-learning: (Online Course Available in WOSM Learning Zone).

Activating the Earth Tribe Initiative in your Community.

MODULE - III STANDARDIZATION - BASICS & BUILDING MATERIALS 8

Basic concepts of standardization; Purpose of Standardization, marking and certification of articles and processes; Importance of standards to industry, policy makers, trade, sustainability and innovation-Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/IEC Directives; Standards on different types of building materials like cement, aggregates, glass and glazing, Reinforcing and prestressing steel, concrete, bricks, stones, timber and bamboo.

TOTAL: 30 PERIODS**REFERENCES:**

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

ONLINE RESOURCES

1. <https://www.cambridgeenglish.org/learning-english>
2. https://lms.scout.org/course_items/show/1172182?course_id=214307#course-item-id=1172182
3. https://lms.scout.org/courses/show/214123?force_course_hub=true

OUTCOMES

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

1. Apply quantitative aptitude for solving numerical problems [K3]
2. Describe logical reasoning to tackle emotional challenges. [K2]
3. Use verbal communication and comprehension skills through grammar and language exercises. [K3]
4. Apply critical thinking and problem-solving skills in various cognitive scenarios. [K3]

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5. Interpret language nuances in diversified situations and exhibit scouting spirits amidst communities. [K2]
6. Explain the basic principle of BIS Standards relevant to EMC and EMI. [K2]

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	-	-	-	-	-	-	-	-	-	1	-	-
C02	-	-	-	-	-	2	-	-	-	-	1	-	-
C03	-	-	-	-	-	-	-	-	2	-	1	-	-
C04	-	2	-	-	-	-	-	-	-	-	1	-	-
C05	-	-	-	-	-	-	-	2	3	-	1	-	-
C06	-	-	-	-	-	3	-	-	-	-	1	-	-

SEMESTER - III

24CEID301 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - I	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To provide opportunities for students to develop an entrepreneurial mindset and explore real-world problem-solving through a startup-centric approach.
- To enable hands-on experience in identifying market needs
- To enable development of skill sets for designing, validating, and realizing a Minimum Viable Product (MVP) for an entrepreneurial venture.
- To guide students in validating market opportunity, and formulating a solution with realistic constraints.
- To inculcate ethical research practices, foster a commitment to lifelong learning, and promote the development of socially responsible and sustainable innovations aligned with relevant Sustainable Development Goals (SDGs).
- To prepare students to design sustainable business models and present entrepreneurial ideas through structured, outcome-driven business pitches using core startup frameworks.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, specifically through the lens of entrepreneurship and innovation.
2. The project work must involve identifying a problem, validating market opportunity, and developing a solution with realistic constraints, culminating in a business plan and prototype/MVP. It must also include appropriate elements of the following: market research, competitive analysis, value proposition design, business model development, financial feasibility, go-to-market strategy, and potentially software/hardware development for the MVP.
3. Project can be individual work or a group project, with a maximum of 3 students. In case of a group project, the individual project report of each student should specify the individual's contribution to the group project. The roles and responsibilities of all team members must be well-defined and documented.
4. On completion of the project, the student shall submit a detailed project report outlining their entrepreneurial journey, solution development, and business plan. The project should be reviewed and the report shall be evaluated, and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION:

1. First evaluation (Milestone 1 - Week 4): 20 marks (Focus on Problem Identification, Opportunity Discovery, Customer & Markets, Value Proposition)
2. Second evaluation (Milestone 2 - Week 8): 30 marks (Focus on Competitive Advantage, Business Model, and MVP Development)
3. Final evaluation (Milestone 3 & 4 - Last week of the semester): 50 marks (Focus on Financial Feasibility, Go-to-Market Strategy, Growth and Scale, Funding Strategy, and Overall Project Report & Viva-Voce)

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

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Apply entrepreneurial thinking to identify and articulate real-world problems and explore market needs using structured approaches. (K3)

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2. Develop skill sets to design potential solutions and validate market opportunities within realistic constraints. (K4)
3. Evaluate sustainable, ethical, and responsible innovation strategies, and communicate business models effectively. (K5)

CO – PO, PSO MAPPING:

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

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SEMESTER - IV

24BSMA403 - SDG NO. 4	STATISTICS AND NUMERICAL METHODS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

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

MODULE -I TESTING OF HYPOTHESIS**12**

Sampling distributions - Statistical hypothesis - large sample tests based on single proportion and difference proportions, single mean and difference of means - Tests based on t, and F-distributions for mean, variance respectively - Chi-square test for independence of attributes - Goodness of fit.

MODULE - II DESIGN OF EXPERIMENTS**9**

One way and two-way classifications - Completely randomized design - Randomized block design - Latin square design.

MODULE - III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**12**

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

MODULE - IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**9**

Lagrange's and Newton's divided difference interpolation - Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical single integrals using Trapezoidal and Simpson's 1/3 rules.

MODULE - V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step method : Milne's predictor corrector method for solving first order differential equations.

MODULE - VI NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

9

Solution of two-dimensional Laplace's and Poisson's equations on rectangular domain-Forward time central space scheme - One dimensional heat flow equation by Crank Nicholson Method-One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Miller and Freund's Probability and Statistics for Engineers, Johnson, R.A., Miller, I and Freund J., 8th Edition, Pearson Education, Asia, 2015.
2. Numerical methods for Scientific and Engineering Computation, Jain M. K., Iyengar S. R. K., Jain R. K., 4th Edition, New Age international Publishers, 2003
3. Numerical Methods in Engineering and Science, Grewal. B.S. and Grewal. J.S., 10th Edition, Khanna Publishers, New Delhi, 2015.

REFERENCES:

1. Numerical Analysis, Burden, R. L. and Faires, J. D., 9th Edition, Cengage Learning, 2016.
2. Probability and Statistics for Engineering and the Sciences, Devore J. L., 8th Edition, Cengage Learning, New Delhi, 2014.
3. Applied Numerical Analysis, Gerald C. F. and Wheatley P.O., 7th Edition, Pearson Education, Asia, New Delhi, 2006.
4. Probability and Statistics for Engineers and Scientists, Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., 8th Edition, Pearson Education, Asia, 2007.
5. Numerical methods, Kandasamy P., Thilagavathy K., Gunavathy K., 3rd Edition, S. Chand, 2006.

WEB REFERENCES:

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

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ONLINE RESOURCES:

1. <https://freevidelectures.com/course/3057/numerical-methods-and-computation>
2. <https://nptel.ac.in/courses/111107105/>

COURSE OUTCOMES

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

1. Apply appropriate statistical hypothesis tests for large and small samples to make inferences about population parameters using t, F, and Chi-square distributions. (K3)
2. Apply appropriate experimental designs such as CRD, RBD, and Latin Square to analyze and interpret data from one-way and two-way classifications. (K3)
3. Apply numerical methods to solve algebraic, transcendental, and linear systems of equations, and compute dominant Eigenvalues using the Power method. (K3)
4. Apply interpolation techniques and numerical methods to approximate derivatives and evaluate definite integrals. (K3)
5. Apply single-step and multi-step numerical methods to solve first-order ordinary differential equations. (K3)
6. Apply finite difference methods to solve partial differential equations such as Laplace, Poisson, heat, and wave equations. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	3
C02	3	-	-	-	-	-	-	-	-	-	-	2	3
C03	3	-	-	-	-	-	-	-	-	-	-	3	3
C04	3	-	-	-	-	-	-	-	-	-	-	2	3
C05	3	-	-	-	-	-	-	-	-	-	-	3	3
C06	3	-	-	-	-	-	-	-	-	-	-	3	3

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SEMESTER - IV

24CEPC401 105104147 SDG NO. 4,9,11,15	SOIL MECHANICS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To explore the fundamentals of soil origin, properties, classification, and analysis methods for engineering applications.
- To assess soil permeability, hydraulic conductivity, seepage mechanisms, and flow net construction in geotechnical engineering
- To understand and evaluate stress distribution and effective stress in soil mechanics
- To examine soil compaction and consolidation behavior through testing and theoretical principle
- To investigate shear strength behavior of soils using Mohr's Coulomb theories and laboratory tests
- To evaluate slope stability using limit equilibrium methods and recommend protective measures

MODULE - I SOIL CLASSIFICATION

8

Introduction - Origin and formation of soils - Rock cycle - Weathering of rock - Clay mineralogy - Soil structure - Mechanical analysis of soil - Particle size distribution - Sieve analysis - Hydrometer analysis - Phase relationship - Index properties - Significance - Soil classification - Particle size classification - Textural classification - HRB classification - Unified classification system - Indian standard soil classification system - Field identification of soils

MODULE - II PERMEABILITY AND SEEPAGE IN SOIL MASS

7

Flow of water through soils - Capillary rise in soils - Hydraulic conductivity - Darcy's law - Estimation of hydraulic conductivity - Constant head and falling head methods - Factors influencing permeability of soils - Vertical and horizontal permeability - Permeability of stratified soil deposits - Seepage analysis - Seepage pressure - Quick sand condition - Laplace equation for 2D flow - Flow nets - Properties - Methods of construction - Applications - Seepage through anisotropic and non-homogeneous soils - Seepage through Earthen dam

MODULE - III STRESS DISTRIBUTION IN SOILS

7

Stress Distribution in soils - Type of stresses in soil - Effective stress concept - Effect of water table fluctuation on effective stress - Effects of seepage and capillarity on effective stress - Stress in soil due to applied load - Boussinesq's

equation - Distribution of stresses within soil mass caused by concentrated load, uniformly distributed load on circular and rectangular areas - Isobar and pressure bulb concept - Stress distribution on horizontal and vertical planes - Newmark's chart and its application - Contact pressure

MODULE - IV COMPACTION AND CONSOLIDATION

8

Soil compaction - Compaction mechanism - Factors affecting compaction - Effect of compaction on soil properties - Density moisture content relationship in compaction test - Standard and modified proctor compaction tests - Field compaction methods - Relative compaction - Compaction control - Introduction to consolidation process - Spring analogy - Primary consolidation and secondary compression - One dimensional consolidation - Terzaghi's theory of one dimensional consolidation - Consolidation test - Determination of coefficient of consolidation

MODULE - V SHEAR STRENGTH

8

Shear strength of soil - Mohr's stress circle - Theory of failure for soils - Determination of shear strength - Direct shear test - Triaxial compression test - Unconfined compression test - Vane shear test - Pore pressure parameters - Shear characteristics of Cohesive and Cohesion less soils

MODULE - VI STABILITY ANALYSIS

7

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

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.
2. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi, 3rd edition, 2014
3. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).

REFERENCE BOOKS:

1. Coduto, D.P., "Geotechnical Engineering - Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 4th edition 2010.
2. Das, B.M., "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.

3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice-Hall, 4th edition, 2006.

ONLINE RESOURCES:

1. <https://www.youtube.com/watch?v=DSsh9UebGqA>
2. <https://nptel.ac.in/courses/105/103/105103177>

WEB REFERENCES:

1. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/>
2. <https://nptel.ac.in/courses/105/103/105103097/>

OUTCOMES

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

1. Develop the concepts of soil formation like soil structure, index properties, engineering properties and Unified soil classification system [K3]
2. Determine the flow characteristics of water through soils, including hydraulic conductivity, permeability estimation, seepage analysis, and flow net construction, to analyze seepage-related issues in geotechnical engineering applications. [K3]
3. Analyze stress distribution in soils, including effective stress, seepage effects, and applied load responses, using theoretical approaches like Bousinessq's equation, isobars, and Newmark's chart [K3]
4. Apply compaction and consolidation principles to assess soil behavior, utilizing compaction tests, field methods, and Terzaghi's theory for geotechnical engineering applications. [K3]
5. Apply shear strength concepts to analyze soil behavior using failure theories and shear tests for cohesive and cohesion less soils in geotechnical engineering applications. [K3]
6. Develop and evaluate slope stability solutions using techniques like total stress analysis, friction circle, and method of slices to enhance slope safety in geotechnical engineering [K4]

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CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	0	1	2	1	0	0	0	0	1	0	1
CO2	3	3	1	3	3	2	0	0	0	0	2	0	1
CO3	3	3	2	2	2	2	0	0	0	0	1	0	1
CO4	3	3	2	2	2	2	0	0	0	0	2	0	1
CO5	3	3	2	2	2	2	0	0	0	0	1	0	1
CO6	3	3	3	3	2	3	1	2	1	2	2	1	2

SEMESTER - IV

24CEPC402 - SDG NO. 4, 9, 12	STRUCTURAL ANALYSIS					L	T	P	CP	C
						3	0	0	3	3

OBJECTIVES:

- To understand strain energy concepts and analyze indeterminate structures.
- To construct and apply influence lines in structural analysis.
- To study the behavior of arches and cables under various effects.
- To analyze beams and frames using slope deflection and moment distribution.
- To apply these methods to multi-storey and laterally loaded frames.
- To introduce matrix methods for analyzing indeterminate structures.

MODULE -I STRAIN ENERGY PRINCIPLES

7

Concept of strain energy and its applications in structural analysis. Determination of static and kinematic indeterminacies. Strain energy method for analyzing continuous beams, plane frames, and indeterminate plane trusses (up to two degrees of redundancy). Application of Castigliano's theorem in structural analysis.

MODULE -II INFLUENCE LINES

9

Influence lines for reactions, shear force, and bending moment in statically determinate beams. Muller Breslau's principle and its applications. Influence lines for shear force, bending moment, and support reactions in statically indeterminate beams (propped cantilever, continuous beams, simply supported beams).

MODULE - III ARCHES AND CABLES**7**

Types of arches – Three-hinged, two-hinged, and fixed arches. Parabolic and circular arches – Effects of settlement and temperature changes. Equilibrium of cables – Length of cable, anchorage of suspension cables. Stiffening girders – Influence lines for three-hinged stiffening girders.

MODULE - IV SLOPE DEFLECTION AND MOMENT DISTRIBUTION**METHOD - BEAMS****8**

Slope deflection equations and equilibrium conditions. Analysis of continuous beams. Rigid frames with inclined members. Support settlements, symmetric and skew-symmetric loading. Stiffness and carry-over factors. Moment distribution method – Distribution and carry-over of moments. Analysis of continuous beams.

MODULE - V SLOPE DEFLECTION AND MOMENT DISTRIBUTION**METHOD - FRAMES****7**

Advanced applications of slope deflection and moment distribution methods. Multi-storey rigid frames and lateral load analysis. Support settlements and special conditions in moment distribution analysis. Application of slope deflection and moment distribution in complex structures.

MODULE - VI FLEXIBILITY AND STIFFNESS METHODS**7**

Primary structures and compatibility conditions. Formation of flexibility matrices – Direct flexibility approach. Stiffness method – Formation of stiffness matrices and equilibrium conditions. Analysis of continuous beams, pin-jointed plane frames by direct stiffness method.

TOTAL : 45 PERIODS**TEXT BOOKS:**

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

REFERENCES:

1. B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Theory of Structures", Laxmi Publications, 2004.
2. William Weaver Jr. & James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers, 1995.
3. C.S. Reddy, "Basic Structural Analysis", Tata McGraw Hill Publishing Company, 2005.
4. Hibbeler, R.C., "Structural Analysis", VII Edition, Prentice Hall, 2012.

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5. Rajasekaran S. & G. Sankarasubramanian, "Computational Structural Mechanics", PHI Learning Pvt. Ltd, 2015.

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105/105/105105166/>
2. <https://nptel.ac.in/courses/105/105/105105180/>
3. <https://nptel.ac.in/courses/105/106/105106050/>
4. <https://www.nps.gov/arch/index.htm>

WEB REFERENCES:

1. NPTEL Course on Structural Analysis
2. NPTEL Course on Influence Lines & Plastic Analysis
3. Structural Analysis LibreTexts

OUTCOMES

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

1. Understand and calculate strain energy in structures and apply this knowledge to analyze statically indeterminate structures. (K3)
2. Construct and use influence line diagrams for determining forces in beams and trusses under moving loads. (K3)
3. Analyze the behavior of arches and suspension cables subjected to different types of loading. (K4)
4. Analyze continuous beams and rigid frames using slope-deflection and moment distribution methods. (K4)
5. Apply structural analysis methods to analyze multi-storey buildings and frames subjected to lateral loads like wind or earthquake. (K4)
6. Use matrix methods for analyzing indeterminate structures. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	1	0	0	0	0	2	3	2
CO2	3	2	2	2	2	1	0	0	1	0	2	3	2
CO3	3	3	2	2	2	3	2	0	0	0	2	3	3
CO4	3	3	2	2	2	1	0	0	0	0	2	2	2
CO5	3	3	3	2	2	2	1	0	1	1	2	3	3
CO6	3	3	3	3	3	2	1	0	1	1	3	3	3

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SEMESTER - IV

24CEPC403 - SDG NO. 4,9&11	TRANSPORTATION ENGINEERING	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand road development, classification, and basic geometric design of highways.
- To learn pavement types, design methods, materials, and construction practices.
- To study railway components and apply geometric design principles for railways.
- To understand construction, maintenance, and operational aspects of railway systems.
- To gain knowledge of airport planning, runway design, and layout considerations.
- To learn harbour types, design principles, and components of coastal structures.

MODULE - I HIGHWAY PLANNING AND GEOMETRIC DESIGN 7

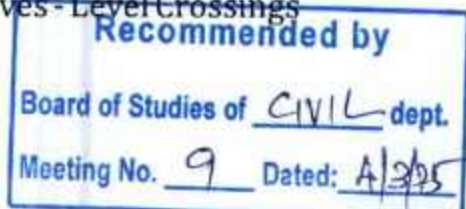
History of road development in India – Classification of highways - Engineering surveys for alignment, objectives, conventional and modern methods. - Typical cross sections of Urban and Rural roads – Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients, hairpin bends

MODULE - II DESIGN OF PAVEMENT & HIGHWAY CONSTRUCTION 8

Pavement components and their role - Design practice for flexible and rigid pavements - Highway construction materials, properties, testing methods - Construction practice of flexible and concrete pavements including modern materials and methods, Highway drainage

MODULE - III RAILWAY PLANNING AND GEOMETRIC DESIGN 7

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - coning of wheels, creep in rails, defects in rails - Geometric design of railway, gradient, super elevation, widening of gauge on curves - Level Crossings



MODULE - IV RAILWAY CONSTRUCTION AND MAINTENANCE 7

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

MODULE - V AIRPORT PLANNING AND DESIGN 8

Airport classification - airport planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, airport site selection - Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design, Configuration and Pavement Design Principles- Airport Zones - Runway and Taxi way Markings.

MODULE - VI HARBOUR ENGINEERING 8

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides - Planning and Design of Harbours: Requirements, Classification, Location and Design Principles - Harbour Layout and Terminal Facilities - Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage - Coastal Regulation Zone, 2011 - Case studies.

TOTAL : 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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6. Veeraragavan. A, Khanna.K and Justo.C.E.G. "Highway Engineering", Nem Chand & Bros Publishers, 2014.

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105/101/105101087/>
2. <https://nptel.ac.in/courses/105/107/105107123/>
3. <https://nptel.ac.in/courses/114106025/>
4. <http://www.ircen.gov.in/ircen/ELearning.jsp>

WEB REFERENCES:

1. <https://www.ice.org.uk/knowledge-and-resources/transportation>
2. <http://www.ircen.gov.in/ircen/Home>
3. <https://www.faa.gov/airports/engineering/>

OUTCOMES

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

1. Apply the knowledge on development, classification, planning, alignment and engineering surveys of highways & Geometric design of all elements. (K3)
2. Design various types of pavements to meet specified needs of safety, efficiency and long-time sustainability and derive knowledge on properties, testing methods of conventional and modern Highway construction materials. (K4)
3. Classify the various functions of Rails, Sleepers, ballast, fixtures and fastenings and geometric design of all elements (K3)
4. Determine the materials required for tracklaying and acquire the knowledge on conventional and modern methods in route alignment. (K3)
5. Gain an insight on the planning and site selection of Airport Planning and design the elements for orientation of runways (K3)
6. Demonstrate the various feature in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted (K3)

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CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	2	-	2	2	-	-	-	-	1	3	2
C02	3	2	3	-	2	2	-	-	-	-	2	3	2
C03	3	2	2	-	1	2	-	-	-	-	1	2	2
C04	3	2	2	-	1	2	-	-	-	-	1	2	2
C05	3	2	2	-	2	2	-	-	-	-	1	3	2
C06	3	2	2	-	2	2	-	-	-	-	1	3	2

SEMESTER - IV

24CEPC404	CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES	L	T	P	CP	C
SDG NO. 4,9,11		3	0	0	3	3

OBJECTIVES:

- A reasonable knowledge about the various construction procedures for sub to super structure
- Knowledge about the equipment needed for construction of various types of structures from foundation to super structure.
- Insight on the different functions and operations of different equipment and techniques during construction
- Knowledge about the various types of construction equipment, their functions, and how to apply them effectively.
- Learned about the importance of safety practices and the use of equipment to improve efficiency and quality in construction projects.
- Exposed to common construction challenges and provide strategies for quality control and problem-solving

MODULE -I CONSTRUCTION TECHNIQUES

8

Structural systems, Load Bearing Structure, Framed Structure, Load transfer mechanism, floor system, High rise Building Technology, Eco Building (Green Building), Material used, Construction methods — 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 zone.

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MODULE - II CONSTRUCTION PRACTICES**8**

Specifications, details and sequence of activities and construction co-ordination, Site Clearance, Marking, Earthwork, masonry, stone masonry, Bond in masonry, concrete hollow block masonry, flooring, damp proof courses, construction joints — movement and expansion joints, pre cast pavements, building foundations, basements, temporary shed, centering and shuttering, slip forms, scaffoldings, de-shuttering forms, weather and water proof, roof finishes, acoustic and fire protection.

MODULE - III SUB STRUCTURE CONSTRUCTION**8**

Techniques of Box jacking, Pipe Jacking, tunneling techniques, sheet piles, shoring for deep cutting - Piling techniques, cable anchoring and grouting.

MODULE - IV UNDER WATER CONSTRUCTION**6**

Well and caisson — sinking cofferdam - under water construction of diaphragm walls and basement driving diaphragm walls— well points - Dewatering and stand by Plant equipment for underground open excavation.

MODULE - V SUPER STRUCTURE CONSTRUCTION**9**

Launching girders, bridge decks, off shore platforms — techniques for heavy decks — in-situ pre-stressing in high rise structures, Material handling — erecting light weight components on tall structures — conveyors — Erection of articulated structures, braced domes and space decks.

MODULE - VI CONSTRUCTION EQUIPMENT**8**

Selection of equipment for earth work — earth moving operations — types of earthwork equipment — tractors, motor graders, scrapers, front end loaders, earth movers — Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting — types of cranes — Equipment for dredging, trenching, tunneling.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

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REFERENCE BOOKS:

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2002.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
4. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi, 1983.

ONLINE RESOURCES:

1. <https://www.coursera.org/specializations/piling-construction-and-practices>
2. <https://www.classcentral.com/course/swayam-construction-methods-and-equipment-management-22940>

WEB REFERENCES:

1. <http://acl.digimat.in/nptel/courses/video/105103206/L20.html>
2. <https://online.umich.edu/courses/construction-equipment-and-methods/>
3. https://onlinecourses.nptel.ac.in/noc21_ce21/preview
4. <http://www.digimat.in/nptel/courses/video/105102088/L01.html>

OUTCOMES

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

1. Explain the Structural systems in various buildings including Natural Buildings, Passive buildings, Intelligent Smart buildings with Building automation [K3]
2. Describe the sequence of activities in construction, bonds in masonries, construction joints and building foundations, water proofing along with acoustic and fire protection. [K3]
3. Summarize the sub structure techniques like jacking, Tunneling, Piling techniques, cable anchoring and grouting [K3]
4. Describe the techniques for under water sub structure constructions [K3]
5. Explain the super structure construction and erection techniques [K3]
6. Summarize the various equipments adapted for different activities of construction [K3]

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CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01	3	2	2	-	2	2	-	-	-	-	2	3	2
C02	3	3	2	2	-	2	-	-	-	-	2	3	2
C03	3	3	2	-	3	2	-	-	-	-	2	2	3
C04	3	2	2	-	3	3	-	-	-	-	2	3	2
C05	3	3	2	-	3	2	-	-	-	-	2	3	2
C06	3	2	2	-	3	2	-	-	-	-	2	3	3

SEMESTER - IV

24HSNC401 - SDG NO. 4	NCC COURSE LEVEL 3					L	T	P	CP	C
						3	0	0	3	0

ARMY WING

PERSONALITY DEVELOPMENT 9

PD 3 Group Discussion: Team Work 2

PD 4 Career Counselling, SSB Procedure & Interview Skills 3

PD 5 Public Speaking 4

BORDER & COASTAL AREAS 4

BCA 2 Security Setup and Border/Coastal management in the area 2

BCA 3 Security Challenges & Role of cadets in Border management 2

ARMED FORCES 3

AF 2 Modes of Entry to Army, CAPF, Police 3

COMMUNICATION 3

C 1 Introduction to Communication & Latest Trends 3

INFANTRY 3

INF 1 Organisation of Infantry Battalion & its weapons 3

MILITARY HISTORY 23

MH 1 Biographies of Renowned Generals 4

MH 2 War Heroes - PVC Awardees 4

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MH 3	Study of Battles - Indo Pak War 1965, 1971 & Kargil	9
MH 4	War Movies	6

TOTAL: 45 PERIODS**NAVAL WING****PERSONALITY DEVELOPMENT 9**

PD 3	Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5	Public Speaking	3

LEADERSHIP 7

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7
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DISASTER MANAGEMENT 13

DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION 3

EA 1	Environmental Awareness and Conservation	3
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GENERAL AWARENESS 4

GA 1	General Knowledge	4
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NAVAL ORIENTATION 6

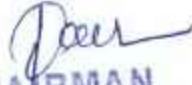
AF 1	Armed Forces and Navy Capsule	3
EEZ 1	EEZ Maritime Security and ICG	3

ADVENTURE 1

AD 1	Introduction to Adventure Activities	1
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BORDER & COASTAL AREAS 2

BCA 1	History, Geography & Topography of Border/Coastal areas	2
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TOTAL: 45 PERIODS**Recommended by**Board of Studies of CIVIL dept.Meeting No. 9 Dated: 4/2/25 |108|

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AIR FORCE WING**PERSONALITY DEVELOPMENT 9**

PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4

BORDER & COASTAL AREAS 4

BCA 2	Security Setup and Border/Coastal management in the area	2
BCA 3	Security Challenges & Role of cadets in Border management	2

AIRMANSHIP 1

A 1	Airmanship	1
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BASIC FLIGHT INSTRUMENTS 3

FI 1	Basic Flight Instruments	3
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AERO MODELLING 3

AM 1	Aero Modelling Capsule	3
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GENERAL SERVICE KNOWLEDGE 2

GSK 4	Latest Trends & Acquisitions	2
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AIR CAMPAIGNS 6

AC 1	Air Campaigns	6
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PRINCIPLES OF FLIGHT 6

PF 1	Principles of Flight	3
PF 2	Forces acting on Aircraft	3

NAVIGATION 5

NM 1	Navigation	2
NM 2	Introduction to Met and Atmosphere	3

TOTAL :45 PERIODS**Recommended by**Board of Studies of CIVIL dept.Meeting No. 9 Dated: 4/3/25

SEMESTER - IV

24CEPL401 - SDG NO. 4, 9	STRENGTH OF MATERIALS AND HYDRAULIC ENGINEERING LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:

- To supplement the theoretical knowledge gained in Mechanics of Solids and Fluid Mechanics with practical testing for determining the strength of materials under externally applied loads
- To enable the students to have a clear understanding of the Design for strength and stiffness and losses in pipe flow
- To understand the flow measurements.
- To analyses the Performance of various Pumps and Turbines

LIST OF EXPERIMENTS :

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

S.No	NAME OF THE EQUIPMENT	QTY
1	Universal Tensile Testing machine with double shear attachment	1
2	Torsion Testing Machine	1
3	Impact Testing Machine	1
4	Brinell Hardness Testing Machine	1
5	Rockwell Hardness Testing Machine	1
6	Spring Testing Machine for tensile and compressive loads	1

HYDRAULIC ENGINEERING LABORATORY

LIST OF EXPERIMENTS

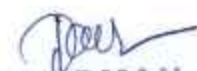
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. ~~Determination of friction factor for a given set of pipes.~~

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4. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump.
5. Conducting experiments and drawing the characteristic curves of reciprocating pump.
6. Conducting experiments and drawing the characteristic curves of Gear pump.
7. Conducting experiments and drawing the characteristic curves of Pelton wheel, Francis and Kaplan Turbine.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

1	Bernoulli's Apparatus.	1 No.
2	Orifice meter setup	1 No.
3	Venturi meter setup	1 No.
4	Pipe Flow analysis setup	1 No.
5	Centrifugal pump/submergible pump setup	1 No.
6	Reciprocating pump setup	1 No.
7	Gear pump setup	1 No.
8	Pelton wheel Turbine setup	1 No.
9	Francis turbine setup	1 No.
10	Kaplan turbine setup	1 No.

TOTAL : 60 PERIODS

OUTCOMES

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

1. Explain and perform different destructive testing's such as Tension test, Shear test, Impact test, Hardness test to estimate the strength under externally applied loads with due consideration to safety. (K4)
2. Estimate and compare the elastic constants such as Young's modulus and Rigidity modulus of the given specimen through Deflection testing and spring testing with standard values. (K4)
3. Measure the flow rate of fluid using different flow measuring devices and calculate the friction loss and other minor losses in a pipe flow. (K4)
4. Predict the basic performance characteristics of hydraulic Pumps. and Turbines. (K4)

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CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CEPL402	CONCRETE AND HIGHWAY ENGINEERING LABORATORY	L	T	P	CP	C
SDG NO. 4, 9		0	0	4	4	2

OBJECTIVES:

- To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.
- To evaluate the consistency and workability of fresh concrete using tests like the slump test and compaction factor test
- To determine the properties of coarse and fine aggregates used in pavement construction
- To analyze the characteristics of bitumen, the binder used in flexible pavements, including penetration, ductility, and viscosity.

LIST OF EXPERIMENTS**I TESTS ON CEMENT**

1. Consistency tests
2. Initial and final setting time

II. TESTS ON FRESH CONCRETE

1. Slump cone test
2. Compaction factor
3. Vee bee test.

III. TESTS ON HARDENED CONCRETE

1. Compressive strength - Cube & Cylinder
2. Flexure test

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IV. TESTS ON AGGREGATES

1. Gradation of Aggregate
2. Abrasion Value
3. Impact Value
4. Flakiness and Elongation Indices

V. TESTS ON BITUMEN

1. Penetration
2. Softening Point
3. Ductility
4. Viscosity

VI. TESTS ON BITUMINOUS MIXES

1. Study on Determination of Binder Content
2. Study on Marshall Stability and Flow values

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

- | | |
|--|-------|
| 1. Concrete cube moulds | 6 |
| 2. Concrete cylinder moulds | 3 |
| 3. Concrete Prism mould | 1 |
| 4. Sieves | 1 set |
| 5. Slump cone | 3 |
| 6. Vicat needle apparatus | 2 |
| 7. Trovels and planers | 1 set |
| 8. Compression Testing Machine (CTM) | 1 |
| 9. Vee Bee Consistometer | 1 |
| 10. Aggregate impact testing machine | 1 |
| 12. Los - Angeles abrasion testing machine | 1 |
| 13. Marshall Stability Apparatus | 1 |
| 14. Bitumen Penetration apparatus | 1 |
| 15. Softening point Apparatus | 1 |
| 16. Pycnometer | 2 |
| 17. Thickness Gauge | 1 |
| 18. Length Gauge | 1 |
| 19. Weighing balance | 1 |
| 20. Compaction Factor Apparatus | 1 |
| 21. Oven | 1 |
| 22. Tamping rods | 2 |

TOTAL : 60 PERIODS

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OUTCOMES

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

1. Explain the tests on fresh concrete and find its workability [K5]
2. Experiment the mechanical strength of hardened concrete. [K4]
3. Identify the properties and quality of aggregates using various tests. [K5]
4. Test the properties of bitumen and Bituminous mixes [K4]

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CETP401	APTITUDE SKILLS - II	L	T	P	CP	C
SDG NO. 4		0	0	2	2	0

PROBLEM SOLVING TECHNIQUES USING C PROGRAMMING – PHASE 1**OBJECTIVES:**

- Build a strong foundation in C programming concepts and problem-solving techniques.
- Develop the ability to write efficient and modular code.
- Enhance understanding of data structures, memory management, and algorithms for optimized solutions.

MODULE - I FOUNDATIONS OF PROGRAMMING**12**

- Understanding Programming Languages: Why they are essential and their various types.
- Operators in C: Exploring assignment, arithmetic, relational, and logical operators.
- Tokens and Identifiers: Learning about keywords, naming conventions, and best practices.
- Control Structures in C: Choosing the right structure for efficient programming.

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- Selective Control (Decision-making statements)
- Iterative Control (Loops for repetition)
- Unconditional Control (Jump statements)

MODULE - II DATA TYPES, NUMBER SYSTEMS, AND FUNCTIONS 12

- Operators in Depth: Understanding increment, decrement, and short-circuit operators.
- Number Systems & Conversions: Mastering different number systems, conversions, and format specifiers.
- Data Types in C: Exploring signed and unsigned types (int, float, char) and their usage.
- Functions in C:
- Importance of modular programming.
- Writing and using functions effectively.

MODULE - III POINTERS, ARRAYS, AND PROBLEM-SOLVING 21

- Pointers in C:
- Understanding memory management.
- How pointers enable direct hardware communication.
- Arrays in C:
- Efficiently storing multiple elements.
- Single-dimensional and multi-dimensional arrays.
- Problem-Solving Techniques:
- Tackling challenges related to arrays and strings.
- Optimizing algorithms for efficiency.

TOTAL: 45 PERIODS

REFERENCES:

1. Let Us C – Yashavant Kanetkar
2. Programming in ANSI C – E. Balagurusamy
3. The C Programming Language – Brian W. Kernighan and Dennis M. Ritchie
4. C: How to Program – Paul Deitel and Harvey Deitel
5. Problem Solving and Program Design in C – Jeri R. Hanly and Elliot B. Koffman

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LIFE SKILLS, RANGER AND ROVER & BIS STANDARDS - PHASE 2**OBJECTIVES:**

- Explore core domain BIS standards related to Information security and AI.
- Implement strategies to learn career and managerial skills for career growth.

**MODULE - I JEEVAN KAUSHAL 2.0 – CAREER SKILLS AND
MANAGERIAL SKILLS**
14

Group Discussion Skills - Meaning and Methods of Group Discussion - Procedure of Group Discussion - Group Discussion - Simulation - Group Discussion - Common Errors.

Managerial Skills - Basic Managerial Skills - Planning for effective management - How to organize teams? - Recruiting and retaining talent - Delegation of tasks - Learn to coordinate - Conflict management - Self-management Skills - Understanding self-concept - Developing self-awareness - Self-examination - Self-reflection and Introspection - Self-regulation.

Entrepreneurial Skills - Basics of Entrepreneurship - Meaning of entrepreneurship - Classification and types of entrepreneurs - Traits and competencies of entrepreneur - Creating Business Plan - Problem identification and idea generation - Idea validation - Pitch making.

Managing Personal Finance - Budgeting - Setting personal goals - Estimate likely expenses Monitor spending to obtain the most value for the available funds - Saving and Investing - Advantages of saving money - Concept of present and future value of money.

MODULE - II RANGER AND ROVER
10

Scouting for Boys: Scout Craft, Campaigning.

Knots: Managing of rope, types of ropes and uses, Basic Knots: - Clove Hitch, Reef Knot, Fisherman knot, Sheet bend, Bowline, Sheep shank, whippings.

Growing Together: Understanding the growth context.

Intergenerational Dialogue: How to enhance learning and cooperation across generations.

Module - III STANDARDS FOR SOIL TESTING AND CONCRETE
6

Introduction to standards for soil testing and identification, sub-surface investigation, general requirements for foundations, shallow and deep foundations and ground improvement technologies. Introduction to standards on concrete production, mix design, types of concrete and their applications, test method standards of fresh and hardened concrete.

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TOTAL: 30 PERIODSBoard of Studies of CIVIL dept.

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REFERENCES:

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. Principles of Geotechnical Engineering, Braja M. Das & Khaled Sobhan, Cengage Learning, 9th Edition, 2017.
3. IS: 10262 – Guidelines for Concrete Mix Design Proportioning, Bureau of Indian Standards (BIS), 2019.
4. IS: 456 – Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards (BIS), 2000.
5. IS: 516 – Methods of Tests for Strength of Concrete, Bureau of Indian Standards (BIS), 1959 (Reaffirmed 2018).

ONLINE RESOURCES

1. https://lms.scout.org/courses/show/214175?force_course_hub=true
2. https://lms.scout.org/courses/show/214194?force_course_hub=true

OUTCOMES

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

1. Understand and apply the fundamentals of C programming for problem-solving. (K2)
2. Utilize control structures, operators, and functions to write modular programs. (K2)
3. Implement pointers and arrays for efficient memory and data management. (K2)
4. Solve real-world problems by designing and optimizing algorithms. (K2)
5. Demonstrate career and managerial skills. (K2)
6. Understand BIS standards for Information security and AI domain. (K2)

CO – PO, PSO MAPPING:

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

SEMESTER - IV

24CEID401 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - II	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To empower students to transform innovative ideas into viable venture blueprints through structured entrepreneurial exploration and opportunity framing.
- To provide experiential learning in adaptive product evolution by focusing on user-centric redesign, iterative testing, and technical refinement.
- To develop proficiency in assessing market traction, decoding customer behavior, and aligning product strategy with investment-readiness metrics.
- To instill a foundation of ethical entrepreneurship by integrating inclusive design principles, sustainability values, and responsible leadership.
- To enable data-driven innovation by leveraging field research, applying performance analytics, and integrating emerging technologies for solution optimization.
- To facilitate multidisciplinary problem-solving through advanced engineering integration, MVP systemization, and standards-compliant validation.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, focusing on the practical execution and refinement of entrepreneurial ventures.
2. The project work must involve the continuous development, iterative enhancement, and potential launch of an entrepreneurial solution. It must also include appropriate elements of the following: compliance with advanced engineering standards, iterative design analysis, enhanced prototyping, robust experimentation, real-world user feedback collection, data correlation, and advanced software/hardware development for the solution.
3. Projects can be individual work or group projects, with a maximum of Three students. In case of a group project, each student must submit an individual project report clearly specifying their unique contributions to the collective work.

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- On completion of the project, the student shall submit a detailed project report encompassing the evolution of their venture, technical implementation, market validation, and future roadmap. The project shall undergo a formal review process, after which the report will be evaluated. Students shall appear for a mandatory viva-voce examination on the project, approved jointly by the Coordinator and the respective project guide.

EVALUATION:

- First evaluation (Immediately after first internal examination): 20 marks (Focus on refined problem statement, advanced MVP design, and detailed development plan)
- Second evaluation (Immediately after second internal examination): 30 marks (Focus on prototype/MVP implementation, initial testing, and preliminary market validation results)
- Final evaluation (Last week of the semester): 50 marks (Focus on the complete refined solution, comprehensive market validation, growth strategy, final project report, and viva-voce)

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

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply structured entrepreneurial exploration to convert innovative ideas into venture blueprints, incorporating user-centric and iterative design approaches. (K4)
- Assess customer behavior and market traction to align product strategies with ethical and sustainable entrepreneurship principles. (K5)
- Integrate multidisciplinary knowledge, field data, and emerging technologies to optimize and validate engineered solutions. (K6)

CO – PO, PSO MAPPING:

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

Recommended by

Board of Studies of CIVIL dept.

Meeting No. 9 Dated: 4/3/25

SEMESTER V

COURSE CODE: 24CEPC501	FOUNDATION ENGINEERING	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105105185	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11 & 15				
PRE-REQUISITE COURSES	24CEPC401					

OBJECTIVES:

- Impart knowledge on planning and executing detailed geotechnical site investigation programmes.
- Select appropriate geotechnical design parameters and suitable foundation systems based on soil conditions.
- Familiarize with the geotechnical design principles of shallow foundations, deep foundations, retaining walls, and special foundation systems.
- Apply codal provisions and engineering concepts in the analysis and design of foundation engineering structures.

MODULE - I SITE INVESTIGATION AND SELECTION OF FOUNDATION 7

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

MODULE - II SHALLOW FOUNDATION 7

Introduction–Location and depth of foundation–Codal provisions–Bearing capacity of shallow foundation on homogeneous deposits –Terzaghi's formula and BIS formula–Factors affecting bearing capacity –Allowable bearing pressure–Seismic considerations in bearing capacity evaluation - Methods of Ground improvement techniques.

MODULE - III SETTLEMENT AND DESIGN OF FOOTINGS AND RAFTS 8

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. Types of Isolated

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.04.26

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

MODULE - IV PILE FOUNDATION

8

Types of piles and their functions-Factors influencing the selection of pile-Carrying capacity of single pile in granular and cohesive soil -Static formula-Dynamic formulae (Engineering news and Hileys)-Capacity from in situ tests (SPT, SCPT)-Negative skin friction - Uplift Capacity - Group Capacity by Different Methods (Feld's rule, Converse - Labarra formula and Block Failure Criterion) - Under Reamed Piles.

MODULE - V CAISSON AND WELL FOUNDATION

7

Types of caisson foundation - Components of well foundation - Depth of well foundation - Selection of well foundation - thickness of the seal for open well - Stability analysis of well foundation, Tilt. and Shift.

MODULE - VI RETAINING WALLS

8

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

TOTAL : 45 PERIODS

TEXT BOOK:

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

REFERENCES:

1. Das, B.M. "Principles of Foundation Engineering" (Eighth edition), Thompson Asia Pvt.Ltd., Singapore, 2013.
2. Kaniraj, S.R., "Design aids in Soil Mechanics and Foundation Engineering", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2002.
3. Varghese, P.C., "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26.

4. Gopal Ranjanand Rao A.S.R. "Basic and Applied soil Mechanics", New Age International (P) Ltd, New Delhi, 2006.
5. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).

ONLINE RESOURCES:

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

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc25_ce120/preview
2. <https://www.coursera.org/specializations/geotechnical-foundation-design>
3. <https://study.madeeasy.in/category/ce/soil-mechanics-foundation-engineering>
4. <https://www.geoengineer.org/publications/online-library>

OUTCOMES:

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

1. Describe the Methods of exploration of soil samples by penetration test and selection of foundation based on soil condition (K2)
2. Describe and solve bearing capacity of shallow foundation by allowable bearing pressure in seismic conditions using Terzaghi's formula and BIS formula (K3)
3. Describe Settlement of foundations Total and differential settlements and different Types of footings and its proportionating applications for seismic forces through codal provisions (K3)
4. Explain about different types of cassion and well foundation Stability analysis of well foundation, Tilt. and Shift. (K3)
5. Interpret the load carrying capacity of different type of piles using different pile load test (K2)
6. Apply the principle of plastic equilibrium in cohesionless and cohesive soil for the Stability analysis of retaining walls (K3)

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CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	1	-	-	-	-	-	-	-	-	1	2	2
C02	3	2	-	-	-	1	-	-	-	-	1	3	1
C03	3	-	2	2	-	2	-	-	-	-	1	3	2
C04	3	2	-	-	-	2	-	-	-	-	1	3	2
C05	3	3	2	2	-	-	-	-	-	-	1	2	1
C06	2	1	3	3	-	1	-	-	-	-	1	3	1

SEMESTER V

COURSE CODE: 24HSMG501	PRINCIPLES OF ENGINEERING MANAGEMENT	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: -	SYLLABUS VERSION 1.1	SDG NO. 4,8,9,10,12				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To Understand the Basic Management Concepts and Principles in Corporate Practices.
- To Apply Management Functions Innovatively in Organizational Practices, globally.

MODULE - I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**8**

Management – Science or Art – Manager Vs Entrepreneur – types of managers – Engineers as Managers. Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current issues and future trends in Management; Industry 5.0 – Engineering management in modern business.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.04.26

MODULE -II PLANNING**8**

Planning, Technology Planning - Nature and purpose of planning - planning process - types of planning - objectives - setting objectives - policies - Planning premises - MBO - process - Principles and functions of engineering management - Planning Tools and Techniques - Decision-making steps and process.

MODULE -III ORGANISING**8**

Nature and purpose - Formal and informal organization - organization chart - organization structure - types - Line and staff authority - departmentalization - delegation of authority - centralization, and decentralization - Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning, and management.

MODULE -IV DIRECTING AND CONTROLLING**7**

Foundations of individual and group behaviour - Motivation - theories and techniques - Leadership - Level 5 leadership - theories - Leadership as a determinant of Engineering management - Communication - process, and barriers - effective communication - Communication and IT - System and process of controlling - budgetary and non-budgetary control techniques.

MODULE -V INNOVATION AND TECHNOLOGY MANAGEMENT**7**

Innovation management of Products and Services, Role of R & D in Entrepreneurship, Breakthrough Innovation, Disruptive Innovation - Modern approaches in Engineering management - Green management, Lean management, Managing diversity. IPR - Principles of Ethics for Engineering Managers.

MODULE -VI MODERN MANAGEMENT FRAMEWORKS AND AI APPLICATIONS**7**

SWOT Analysis - PESTLE Analysis - Agile Management Principles - Design Thinking for Problem Solving - AI in Workforce Analytics and Performance Management - Generative AI for Knowledge Management and Innovation - Ethical and Responsible AI in Management.

TOTAL : 45 PERIODS

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-04-26

TEXTBOOKS:

1. Tripathy, P.C. and Reddy, P.N., Principles of Management, McGraw-Hill Education, 2023 Edition.

REFERENCES:

1. Robbins, S.P., Coulter, M.A. and Long, L., Management, 16th Edition, Pearson, 2025.
2. Stoner, J.A.F., Freeman, R.E. and Gilbert, D.R., Management, 6th Edition, Pearson Education.
3. Robbins, S.P., Coulter, M.A. and DeCenzo, D.A., Fundamentals of Management, 11th Edition, Pearson Global Edition, 2026.
4. Kreitner, R. and Mohapatra, M., Management, Cengage Learning India.
5. Koontz, H., Weihrich, H. and Cannice, M., Essentials of Management, 11th Edition, McGraw-Hill.
6. Iansiti, M. and Lakhani, K., Competing in the Age of AI, Harvard Business Review Press.
7. Osterwalder, A. and Pigneur, Y., Business Model Generation, Strategyzer.
8. Lewrick, M., Link, P. and Leifer, L., The Design Thinking Playbook, Wiley.

WEB RESOURCES:

1. [https:// www. managementstudyguide. com/ organization-management.htm](https://www.managementstudyguide.com/organization-management.htm)
2. <https://nptel.ac.in/courses/110/105/110105034/>
3. <https://courses.lumenlearning.com/boundless-management/chapter/principles-of-management/>

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/110/105/110105033/>

OUTCOMES:

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

1. Explain the fundamental concepts, theories and evolution of management in engineering organizations. (K2)
2. Apply planning principles and decision-making techniques for organizational problem solving. (K3)

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3. Analyze organizational structures and human resource management practices in engineering enterprises. (K4)
4. Demonstrate leadership, communication and control mechanisms for effective organizational performance. (K3)
5. Examine innovation, technology management, sustainability and ethical practices in engineering management. (K4)
6. Apply modern management frameworks and AI-enabled managerial tools to support strategic and operational decisions. (K3)

CO - PO, PSO MAPPING:

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

SEMESTER V

COURSE CODE: 24MGMC501	CONSTITUTION OF INDIA	L	T	P	CP	C
		2	0	0	2	0
NPTEL CODE: -	SYLLABUS VERSION 1.1	SDG NO. 4, 9				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

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

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.04.26

MODULE - I INTRODUCTION**5**

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

MODULE - II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT**5**

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

MODULE - III STRUCTURE AND FUNCTION OF STATE GOVERNMENT**5**

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

MODULE - IV CONSTITUTION FUNCTIONS**5**

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

MODULE - V CONSTITUTIONAL REMEDIES**5**

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

MODULE - VI CONSTITUTIONAL GOVERNANCE IN THE DIGITAL ERA AND CONTEMPORARY ISSUES**5**

Constitutional Values and Good Governance – Right to Information (RTI) and Citizen Participation – Digital Governance and e-Governance Initiatives in India – Constitutional Perspectives on Artificial Intelligence (AI) and Emerging Technologies.

TOTAL : 30 PERIODS**TEXT BOOKS:**

1. Durga Das Basu, Introduction to the Constitution of India, 27th Edition (2024), LexisNexis Butterworths Wadhwa.
2. M. V. Pylee, An Introduction to the Constitution of India, Latest Revised Edition (2024), Vikas Publishing House.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

3. P. M. Bakshi, The Constitution of India, 18th Edition (2025), Universal LexisNexis
4. Brij Kishore Sharma, Introduction to the Constitution of India, 15th Edition (2024), PHI Learning

REFERENCE BOOKS:

1. D. D. Basu, Shorter Constitution of India, Latest Revised Edition, LexisNexis
2. Subhash C. Kashyap, Our Constitution: An Introduction to India's Constitution and Constitutional Law, Latest Edition, National Book Trust
3. M. Laxmikanth, Indian Polity, 7th Edition (2025), McGraw Hill Education
4. J. N. Pandey, Constitutional Law of India, Latest Edition (2024), Central Law Agency.
5. V. N. Shukla, Constitution of India, Revised by Mahendra Pal Singh, 14th Edition / Latest Available Edition, Eastern Book Company

ONLINE REFERENCES

1. <https://iasexamportal.com/ebook/the-constitution-of-india>
2. https://eclass.cc/courses/udemy_basics_of_indian_constitution_a_refresher_course
3. <https://ox.libguides.com/c.php?g=422964&p=2888489>
4. <https://mylaw.net/litigation/constitutional-law-course>
5. www.tutorialspoint.com/indian_polity/indian_polity_sources_constitution.htm
6. www.drishtiias.com/gs-special/gs-special-polity/important-sources-of-the-indian-constitution
7. www.india.gov.in/my-government/constitution-india/constitution-india-full-text
8. <http://legislative.gov.in/constitution-of-india>

MOOC REFERENCES

1. <https://www.mooc-list.com/tags/law>
2. <https://www.udemy.com/course/polity-and-constitution/>
3. https://swayam.gov.in/nd2_cec19_hs13/preview
4. <https://www.udemy.com/course/basics-of-indian-constitution-a-refresher-course/>

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.04.26

OUTCOMES:

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

1. Explain the historical evolution, philosophy and fundamental principles of the Constitution of India. (K2)
2. Describe the structure, powers and functions of the Union Government under the Constitution. (K2)
3. Interpret the structure and functioning of State Governments and the judicial system in India. (K2)
4. Analyze federal relations, constitutional amendments and constitutional functionaries. (K4)
5. Examine constitutional remedies and mechanisms for protection of fundamental rights. (K4)
6. Apply constitutional values and principles to contemporary governance, digital rights, AI ethics and emerging societal challenges. (K3)

CO - PO, PSO MAPPING:

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

Recommended in Board of Studies (BoS) Meeting No. 40 held on 29-4-26

SEMESTER V

COURSE CODE: 24CEPL501	SOIL MECHANICS LABORATORY	L	T	P	CP	C
		0	0	3	3	1.5
NPTEL CODE: 105101160	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24CEPC301 & 24CEPC401					

OBJECTIVES:

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

LIST OF EXPERIMENTS:

Determination of Index Properties

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

Determination of In-situ density and Compaction Characteristics

1. Field density Test (Sand replacement method and Core cutter method)
2. Determination of moisture-density relationship using standard proctor compaction test
3. Determination of Relative density (Demonstration only)

Determination of Engineering Properties

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

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-04-26

Test on Geo-synthetics (Demonstration only)

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

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

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

TOTAL : 60 PERIODS**TEXT BOOK:**

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

REFERENCES:

1. Das, B.M. "Principles of Foundation Engineering" (Eighth edition), Thompson Asia Pvt.Ltd., Singapore, 2013.
2. Kaniraj, S.R., "Design aids in Soil Mechanics and Foundation Engineering", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2002.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

3. Varghese, P.C., "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005.
4. Gopal Ranjan and Rao A.S.R. "Basic and Applied soil Mechanics", New Age International (P) Ltd, New Delhi, 2006.
5. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).

ONLINE RESOURCES:

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

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc25_ce120/preview
2. <https://www.coursera.org/specializations/geotechnical-foundation-design>
3. <https://study.madeeasy.in/category/ce/soil-mechanics-foundation-engineering>
4. <https://www.geoengineer.org/publications/online-library>

OUTCOMES:

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

1. Apply appropriate laboratory procedures to determine the index properties of soils [K3]
2. Execute field and laboratory methods to evaluate in-situ density and compaction characteristics [K3]
3. Perform standard test methods to assess compressibility, permeability, and shear strength of soil [K3]
4. Experiment with testing techniques to evaluate the properties and performance of geosynthetics [K3]

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	3	2	-	2	1	-	-	-	1	-	-	2	1
CO2	3	2	2	2	2	1	-	-	-	-	-	2	1
CO3	3	3	2	3	2	1	-	-	1	-	1	3	2
CO4	2	2	1	2	3	1	-	-	1	-	1	2	2

SEMESTER V

COURSE CODE: 24ECTP501	SKILL ENHANCEMENT	L	T	P	CP	C
		0	0	2	2	1
NPTEL CODE: -	SYLLABUS VERSION 1.1	SDG NO. 4, 9				
PRE-REQUISITE COURSES	-					

APTITUDE & COGNITIVE SKILLS - PHASE 1**OBJECTIVES:**

- Educate and enrich students on quantitative ability, reasoning ability, and verbal ability.
- Build a strong foundation for solving recruitment-based problems with speed and accuracy.
- Enhance creative thinking skills.
- Enhance logical problem-solving skills.

MODULE -I QUANTITATIVE ABILITY**22**

Number Properties, Speed Math, HCF and LCM, Percentages, Time and Work, Time Speed and Distance, Ratio Proportion and Variations, Averages Mixtures and Alligation

MODULE -II QUANTITATIVE ABILITY REASONING ABILITY**16**

Profit and Loss, Simple Interest and Compound Interest, Blood Relation, Directions, Coding and Decoding, Series, Ranking and Arrangements

Recommended in Board of Studies (BoS) Meeting No. 10

held on

29.4.26

MODULE - III VERBAL ABILITY

Subject-Verb Agreement, Tenses, Prepositions - Concepts, Error Spotting, Sentence Correction, Fill in the Blanks

TOTAL : 45 PERIODS**REFERENCES**

1. Quantitative Aptitude for Competitive Examinations – R.S. Aggarwal
2. A Modern Approach to Logical Reasoning – R.S. Aggarwal
3. High School English Grammar & Composition – Wren & Martin
4. Word Power Made Easy – Norman Lewis.
5. Fast Track Objective Arithmetic – Rajesh Verma

BIS STANDARDS, RANGER AND ROVER, LIFE SKILLS – PHASE 2**OBJECTIVES**

To enable students to,

- Familiarize the team and leadership skills.
- Understand the standards relevant to ECE.

MODULE - I JEEVAN KAUSHAL 2.0 - COGNITIVE SKILLS, INNOVATIVE LEADERSHIP AND DESIGN THINKING, ETHICS AND INTEGRITY

14

Cognitive and Non-cognitive Skills - Cognitive Skills: Meaning, Types of Cognitive Skills, Strategies to Develop Cognitive Skills- Critical Thinking Skills- Problem-solving skills - Ability to Learn, Non-cognitive Skills: Meaning and Types of Non-cognitive Skills, Strategies to Develop Non-cognitive Skills- Empathy- Creativity- Teamwork- Collaboration- Resilience - Interpersonal Skills- Perseverance- Social Control- Social Skill, Peer Pressure - Stress and Stress Management.

Innovative Leadership and Design Thinking- Concept of emotional and social intelligence, Concept of emotional and social intelligence, Innovative Leadership- Synthesis of human and artificial intelligence, Why does culture matter for today's global leaders? Design Thinking- What is design thinking?, Key elements of design thinking, How to transform challenges into opportunities?, How to develop human-centric solutions for creating social good?

Ethics and Integrity - Learning through Biographies - What makes an individual great?, Understanding the persona of a leader for deriving holistic inspiration, Drawing insights for leadership, How leaders sail through difficult situations? Ethics and Conduct - Importance of ethics, Ethical decision making, Personal and professional moral codes of conduct, creating a harmonious life

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - II RANGER AND ROVER**10**

Scouting for Boys: Camp Life, Trekking Wood Craft.

Community Service: Meaning, Types of Community Service & duration, difference between Community Service and Community Development.

WOSM / WAGGGS / Govt. of India Initiatives (One Event At least) - Surf Smart, Free Being Me, Messengers of Peace, Scouts of the World Award

Messengers of Peace and Scouts

MODULE - III STANDARDS FOR RCC, STEEL AND EARTHQUAKE DESIGN**6**

Introduction to IS 456 and basic concrete design. Introduction to IS 800, Types of Structural Steel. Introduction to different Indian Standards on Steel Structures. Introduction to IS 11384 Composite Design. Loading Codes, Fabrication and Erection. General principles of earthquake resistant design. Different lateral load resisting systems. Basic seismic design standards.

TOTAL :30 PERIODS**REFERENCES:**

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

ONLINE RESOURCES

1. https://lms.scout.org/courses/show/214209?force_course_hub=true
2. https://free-being-me.com/wp-content/media/ABC_OLDER-2.pdf
3. <https://www.wagggs.org/en/what-we-do/surf-smart-20/surf-smart-get-involved/>

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

1. Demonstrate improved quantitative aptitude for solving numerical problems. [K2]
2. Apply logical reasoning to tackle reasoning-based challenges. [K2]
3. Enhance verbal communication and comprehension skills through grammar and language exercises. [K2]

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

4. Use ethical principles, emotional intelligence, and leadership insights from biographies to practice responsible decision-making and professional conduct. (K3)
5. Illustrate the objectives and practices of WOSM/WAGGGS and Government of India initiatives such as Messengers of Peace, Surf Smart, and Scouts of the World Award. (K3)
6. Apply the provisions of IS 456, IS 800, IS 11384, loading codes, and seismic design standards in the basic design of reinforced concrete, steel, composite, and earthquake-resistant structures. (K3)

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	2	2	-	-	-	-	-	-	2	-	-
C02	2	2	2	2	1	-	-	-	1	-	2	-	-
C03	2	2	2	2	-	-	-	-	1	-	2	-	-
C04	-	-	-	-	-	2	-	3	3	3	-	2	2
C05	-	-	-	-	-	3	2	2	2	2	1	2	2
C06	3	2	2	-	3	1	-	-	-	-	-	2	2

SEMESTER V

COURSE CODE: 24ECID501	PROTOTYPE DEVELOPMENT LABORATORY – I	L	T	P	CP	C
		0	0	0	4	1
NPTEL CODE: -	SYLLABUS VERSION 1.1	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24ESID101, 24ESID201, 24SCID301, 24SCID401					

OBJECTIVES:

- To enable students to transform innovative ideas into feasible prototype solutions through structured problem identification, design thinking, and concept development.

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- To provide experiential learning in prototype design and development by focusing on user-centric requirements, iterative design, and technical validation.
- To develop proficiency in problem analysis, feasibility assessment, requirement engineering, and prototype implementation.
- To instill a foundation of innovation and entrepreneurship by integrating ethical design principles, sustainability values, and responsible technology development.
- To enable data-driven solution development through literature survey, user feedback analysis, and technology exploration.
- To facilitate multidisciplinary problem-solving through engineering design, prototype realization, testing, validation, and technical communication.

COURSE METHODOLOGY

- This course is designed to develop innovation-oriented thinking and practical problem-solving abilities through prototype development activities focusing on real-world challenges.
- The project work shall involve the identification of a problem, requirement analysis, feasibility study, solution design, prototype development, testing, validation, and documentation. Students shall apply design thinking principles throughout the development cycle.
- Projects may be carried out individually or in groups with a maximum of three students. In the case of group projects, each student shall submit an individual project contribution report clearly specifying their role and responsibilities.
- Students shall maintain a detailed project portfolio containing problem statements, literature survey findings, design documents, prototype iterations, testing results, and validation reports.
- Periodic reviews shall be conducted to assess progress in prototype development, implementation, testing, and refinement. Students shall demonstrate prototype functionality during review evaluations.
- At the end of the semester, students shall submit a comprehensive project report and present a working prototype for evaluation by the course coordinator and project review committee.

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EVALUATION

1. First Evaluation (Immediately after first internal examination): 20 Marks
(Problem Identification and Validation, Literature Survey, Requirement Analysis, Initial Design Proposal)
2. Second Evaluation (Immediately after second internal examination): 30 Marks
(Prototype Design Completion, Prototype Development Progress, Initial Testing and Validation Results)
3. Final Evaluation (Last week of the semester): 50 Marks
(Functional Prototype Demonstration, Innovation and Creativity, Technical Implementation, Project Report, Viva-Voce)

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

TOTAL : 30 PERIODS

OUTCOMES:

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

1. Analyze real-world problems, user requirements, and design constraints to formulate innovative prototype solutions using design thinking methodologies. (K4)
2. Evaluate alternative technologies, development approaches, and feasibility aspects for prototype design and implementation. (K5)
3. Create functional prototypes by integrating appropriate tools, technologies, and engineering principles to address identified problems. (K6)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	3	2	-	2	-	-	-	-	-	-	2	3
C02	3	3	3	--	3	-	-	-	-	-	-	2	3
C03	3	3	3	-	3	-	-	-	-	-	-	3	3

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL501	PRINCIPLES OF CONSTRUCTION MANAGEMENT	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105104161	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To introduce the fundamental principles of construction planning and task definition.
- To provide knowledge of scheduling methods, CPM techniques, and project time management.
- To develop skills in resource allocation and advanced project scheduling.
- To familiarize students with project cost control, budgeting, and financial monitoring.
- To impart understanding of construction quality standards and safety management.
- To enable effective use of project information systems and database tools.

MODULE - I CONSTRUCTION PLANNING

7

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.

MODULE - II SCHEDULING PROCEDURES AND TECHNIQUES

7

Construction Schedules – Critical Path Method – Scheduling Calculations – Float – Presenting Project Schedules – Scheduling for Activity-on-Node with Leads, Lags, and Windows – Scheduling for Activity-on-Arrow with Leads, Lags, and Windows

MODULE - III RESOURCE SCHEDULING AND PERT TECHNIQUE

7

Scheduling with Resource Constraints and Precedence – Use of Advanced Scheduling Techniques – Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Trade-offs – Improving the Scheduling Process

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - IV COST CONTROL, MONITORING AND ACCOUNTING 8

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.

MODULE - V QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 8

Safety - 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.

MODULE - VI ORGANIZATION AND USE OF INFORMATION 8

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

TEXT BOOKS

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2. Srinath, L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

REFERENCES:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
2. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.
3. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.
4. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.
5. Construction Management and Planning by Sengupta, B. and Guha, H., published by McGraw-Hill Publications. 2011

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105104161>
2. <https://nptel.ac.in/courses/105104348>

OUTCOMES:

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

1. Apply basic construction planning concepts to develop preliminary work plans. (K3)
2. Develop project schedules using AON, AOA and float analysis techniques. (K3)
3. Organize project activities using resource scheduling, PERT, Monte Carlo simulation, and project crashing to achieve time-cost optimization. (K3)
4. Apply cost control, budgeting, forecasting, and cash-flow management techniques to project scenarios. (K3)
5. Construct quality and safety frameworks by integrating specifications and statistical quality control methods. (K3)
6. Solve project information management problems using appropriate database tools. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	-	-
C02	3	-	-	-	-	-	-	-	-	-	-	3	-
C03	3	-	-	-	2	-	-	-	-	-	-	3	-
C04	3	-	-	-	2	-	-	-	-	-	-	3	2
C05	3	-	-	-	-	-	1	-	-	-	-	3	2
C06	3	-	-	-	-	-	-	-	2	-	-	3	2

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL502	INFRASTRUCTURE PLANNING AND MANAGEMENT	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24CEPC403					

OBJECTIVES:

- To develop a deep understanding of the fundamental characteristics and current status of diverse sectors—including power, water, transportation, and telecommunications—across both urban and rural contexts in India.
- To master the sequential phases of infrastructure development, from initial planning and SEZ integration to the complex legal and financial structuring required to reach financial close.
- To critically examine the benefits and socio-political hurdles of private sector involvement through global and domestic case studies, while identifying economic, demand-side, and legal risks inherent in large-scale projects.
- To design robust risk-mitigation frameworks and sustainable contracts using digital systems, innovative modeling, and fair negotiation techniques to ensure long-term operational and environmental success.

MODULE - I AN OVERVIEW OF BASIC CONCEPTS RELATED TO INFRASTRUCTURE

7

Introduction to Infrastructure, an overview of the Power Sector in India., an Overview of the Water Supply and Sanitation Sector in India., an overview of the Road, Rail, Air and Port Transportation Sectors in India., an overview of the Tele communications Sector in India., an overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India,

MODULE - II INTRODUCTION TO SPECIAL ECONOMIC ZONES

7

Introduction to Organizations and layers in the field of Infrastructure, Stages of an Infrastructure Project Lifecycle., an overview of Infrastructure Project Finance.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - III PRIVATE INVOLVEMENT IN INFRASTRUCTURE 8

A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study, Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

MODULE - IV CHALLENGES TO SUCCESSFUL INFRASTRUCTURE PLANNING AND IMPLEMENTATION 8

Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

MODULE - V STRATEGIES FOR SUCCESSFUL INFRASTRUCTURE PROJECT IMPLEMENTATION 7

Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects.

MODULE - VI SUSTAINABLE DEVELOPMENT OF INFRASTRUCTURE 8

Information Technology and Systems for Successful Infrastructure Management, -Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Pravin Jadhav and Rahul Nath Choudhury (Springer Publishing), Infrastructure Planning and Management in India: Opportunities and Challenges.
2. Prasanna Chandra (McGraw Hill Education), Projects: Planning, Analysis, Selection, Financing, Implementation, and Review

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

REFERENCES:

1. Goodman, A. S., & Hastak, M. (2006/2015). Infrastructure Planning Handbook: Planning, Engineering, and Economics, McGraw-Hill.
2. Mallick, R. B., & El-Korchi, T. (2017). Pavement Engineering: Principles and Practice (3rd Edition), CRC Press.
3. Bommireddipalli, N. (2020). Infrastructure Management: Basic Principles, CRC Press.
4. Uddin, W., Hudson, W. R., & Haas, R. (2013). Public Infrastructure Asset Management (2nd Edition), McGraw-Hill Education.

WEB RESOURCES:

1. NPTEL – Infrastructure Planning and Management. Infrastructure Planning and Management - IIT Madras.
2. World Bank Open Knowledge Repository (Infrastructure), World Bank Infrastructure Data & Reports / Open Knowledge Repository.

ONLINE RESOURCES:

1. NPTEL: Infrastructure Planning and Management (IIT Madras), Archive.NPTEL.ac.in.
2. World Bank: Private Participation in Infrastructure (PPI) Database, PPI.Worldbank.org.
3. India Infrastructure Report (IIR) - IDFC / Invest UP, Invest UP / IDFC Foundation.

OUTCOMES:

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

1. Explain the basic concepts related to Infrastructure Projects like Power Sector, Water Supply and Sanitation Sector, etc., and the Stages of an Infrastructure Project Lifecycle and project finance. (K4)
2. Analyze the Special Economic Zones, Organizations, layers and the Stages of an Infrastructure, Project Lifecycle and project finance. (K4)
3. Analyze the role of the private sector in infrastructure growth, benefits, problems and Challenges in Privatization with case studies. (K4)
4. Explain the challenges to successful infrastructure planning and implementation in relation with facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks. (K4)

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- Analyze strategies for successful infrastructure project implementation for risk management, mitigation of risks and to know about fair process and negotiation. (K4)
- Explain Sustainable development of Infrastructure in the field of Information Technology and Systems using modelling tools. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	2	-	-	-	3	1	2	1
C02	3	2	-	-	-	2	-	-	-	3	1	2	2
C03	3	2	-	-	-	3	2	-	-	2	2	3	2
C04	3	1	-	-	-	2	-	-	-	2	1	2	1
C05	3	2	-	-	-	2	2	-	-	2	2	3	2
C06	3	2	-	-	3	3	-	1	2	-	3	3	3

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL503	STRATEGIC PLANNING FOR INFRASTRUCTURE SECTORS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11 & 15				
PRE-REQUISITE COURSES	24CEPC403					

OBJECTIVES:

- To analyze the structural links between Power, Water, and Transport sectors, evaluating how their cumulative development drives national economic growth and urban-rural integration.
- To evaluate various Public-Private Partnership (PPP) models and risk-sharing structures, identifying the most viable procurement strategies to ensure financial stability throughout the project lifecycle.

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- To investigate the effectiveness of Indian privatization strategies (e.g., Power and Telecom) by balancing operational efficiency gains against the challenges of social equity and public accessibility.
- To deconstruct political, economic, and social risks while integrating Information Technology and Life-Cycle Analysis to design sustainable contracts and fair stakeholder negotiation processes.

MODULE - I FUNDAMENTALS OF INFRASTRUCTURE SYSTEM 8

Definition, scope and classification of infrastructure – Economic and social infrastructure systems – Transportation infrastructure including road, rail, air and port sectors – Power and telecommunications sectors – Urban and rural infrastructure in India – Special economic zones – Organizations, institutions and stakeholders in infrastructure development.

MODULE - II INFRASTRUCTURE PROJECT FINANCE AND PROCUREMENT 7

Infrastructure project finance and funding mechanisms – Procurement processes and concession frameworks – Public-private partnership models – Project design and award mechanisms – Financial risk analysis – Credit rating of infrastructure projects – Credit allocation framework for infrastructure projects

MODULE - III PRIVATE SECTOR PARTICIPATION AND INFRASTRUCTURE PRIVATIZATION 8

Private sector involvement in infrastructure development - Concepts and models of infrastructure privatization - Benefits and limitations of privatization – Privatization of water supply, power and road transportation sectors - Infrastructure privatization practices in India

MODULE - IV RISK AND CHALLENGES IN INFRASTRUCTURE PROJECTS 7

Infrastructure planning and implementation challenges – Economic and demand risks – Political risks – Social and environmental risk – Cultural risks in international infrastructure projects – Legal and contractual issues – Construction, operation and maintenance challenges in infrastructure projects.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - V STRATEGIES FOR SUCCESSFUL INFRASTRUCTURE IMPLEMENTATION

8

Risk management frameworks for infrastructure projects – Planning phase risk mitigation strategies – Sustainable contract design – Fair process and negotiation principles – Multi-stakeholder negotiation – Socio-economic analysis and sustainable development of infrastructure

MODULE - VI INFRASTRUCTURE MANAGEMENT, INNOVATION AND GOVERNANCE

7

Infrastructure management systems and information technology applications – Innovative design and maintenance of infrastructure facilities – Infrastructure modeling techniques – Life-cycle analysis of infrastructure projects – Capacity building and government's role in infrastructure implementation – Integrated framework for infrastructure planning and management.

TOTAL : 45 PERIODS

TEXT BOOKS

1. 'Infrastructure Planning Handbook' by Prof Makarand Hastak, ASCE Press
2. 'Strategic Management of Large Engineering Projects' by Miller and Lessard

REFERENCES:

1. David I. Cleland and Roland Gareis, "Global Project Management Handbook: Planning, Organization and Controlling International Projects", 2nd edition, McGraw Hill Series, 2006
2. Jeffrey L. Beard, Edward C. Wundran, Michael C. Loulakis, "Design, Build: Planning through development", McGraw Hill Series, 2001
3. Richard Lambeck, John Eschemuller, "Urban Construction Project Management", McGraw Hill Series, 2009
4. Sidney Levy, "Project Management in Construction", McGraw Hill Series, 5th edition, 2006
5. VISION -TAMILNADU 2023-Strategic plan for Infrastructure Development in Tamilnadu

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_mg81/preview
2. World Bank: Public-Private Partnership (PPP) Resource Center, ppp.worldbank.org

WEB RESOURCES:

1. NPTEL: Infrastructure Planning and Management (IIT Madras) NPTEL Course Portal - IIT Madras
2. India Infrastructure Report (IIR) Archive, IDFC Foundation / NIUA India Infrastructure Report 2023
3. Global Infrastructure Hub (GI Hub) – A G20 Initiative, Global Infrastructure Hub Resources
4. World Bank: Public-Private Partnership (PPP) Resource Center, PPP Resource Center (PPPRC)

OUTCOMES:

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

1. Explain fundamental concepts of infrastructure systems to classify infrastructure sectors and interpret their role in national development. [K4]
2. Examine infrastructure project finance mechanisms, procurement processes and public-private partnership models for infrastructure projects. [K4]
3. Analyze private sector participation and privatization strategies in infrastructure sectors with reference to Indian practices. [K4]
4. Analyze economic, political, social, environmental and contractual risks in infrastructure projects to support decision-making [K4]
5. Explain risk management frameworks, stakeholder management strategies and negotiation principles to achieve sustainable infrastructure project outcomes. [K4]
6. Analyze infrastructure management and governance strategies using life-cycle analysis, innovative design and sustainability practices. [K4]

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	2	-	-	-	-	2	-	-	-	1	1	2	1
CO2	-	2	-	-	-	1	-	-	-	3	1	3	2
CO3	-	2	-	2	-	3	2	-	-	2	2	2	3
CO4	-	3	-	2	-	2	1	-	-	2	1	3	2
CO5	-	3	2	-	-	2	2	1	2	2	2	2	3
CO6	2	2	3	-	2	3	-	-	-	2	3	3	3

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL504	INTRODUCTION TO ENGINEERING SEISMOLOGY	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105108204	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11 & 15				
PRE-REQUISITE COURSES						

OBJECTIVES:

- To understand the fundamentals of engineering seismology and earthquake sources.
- To study seismic wave propagation and methods of earthquake measurement.
- To understand seismic instrumentation and interpretation of ground motion data.
- To analyze regional seismicity and seismic zonation concepts.
- To introduce earthquake data analysis and limitations of prediction models.
- To apply seismic hazard analysis through case studies for disaster management.

MODULE - I FUNDAMENTALS OF ENGINEERING SEISMOLOGY 8

Types of Earthquakes - Impact of Earthquakes on Structures - Elastic Rebound Theory - Earthquake Sources - Plate Tectonics - Plate Boundaries - Continental Drift

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - II SEISMIC WAVE PROPAGATION AND EARTHQUAKE MEASUREMENT

7

Theory of Seismic Wave Propagation - Seismic Waves (P-waves, S-waves, Surface Waves) - Wave Channels - Shadow Zones - Earthquake Measurement (Intensity: Mercalli Scale, Magnitude: Richter Scale, Moment Magnitude Scale) - Seismographs - Past Earthquakes

MODULE - III SEISMIC INSTRUMENTATION AND DATA INTERPRETATION

8

Earthquake Instruments - Seismographs - Sensors (Mechanical Sensors, Digital Sensors) - Seismic Stations - Seismic Record Interpretation - Seismograms - Identification of Natural vs Man-Made Events - Ground Motion Analysis - Time Domain Analysis - Frequency Domain Analysis

MODULE - IV REGIONAL SEISMICITY AND SEISMIC ZONATION

7

Focuses On Regional Seismicity - Major Earthquakes In India - And Significant Global Earthquake Events. Introduces Seismic Zonation Concepts - Methodologies for Seismic Microzonation - And Techniques Used for Seismic Risk Assessment in Different Regions

MODULE - V EARTHQUAKE DATA ANALYSIS AND PREDICTIVE MODELS

8

Introduction to Earthquake Data Analysis - Types of Earthquake Data (Seismic, Geodetic, Historical) - Seismic Data Interpretation and Visualization - Limitations and Challenges in Earthquake Prediction

MODULE - VI SEISMIC HAZARD ANALYSIS AND CASE STUDIES

7

Statistical Methods in Earthquake Analysis - Case Studies of Earthquake Data Analysis Applications in Disaster Management and Early Warning Systems

TOTAL : 45 PERIODS

TEXT BOOKS

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2. Srinath, L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

REFERENCES:

1. Shearer, Peter M. – Introduction to Seismology – Cambridge University Press – 2nd Edition (2009).
2. Bolt, Bruce A. – Earthquakes: Their Occurrence and Mechanism – W. H. Freeman – 5th Edition (2006).

REFERENCES:

1. Lay, Thorne and Wallace, Terry C. – Modern Global Seismology – 1st Edition – Academic Press (1995).
2. Kramer, Steven L. – Geotechnical Earthquake Engineering – 1st Edition – Pearson Education (1996).

ONLINE RESOURCES:

1. United States Geological Survey (USGS) - Earthquake Hazards Program – <https://earthquake.usgs.gov/>
2. International Seismological Centre (ISC) - Seismic Data & Research – <http://www.isc.ac.uk/>

OUTCOMES:

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

1. Identify the fundamentals of engineering seismology including types of earthquakes, plate tectonics, and elastic rebound theory – (K3)
2. Apply the concepts of seismic wave propagation and earthquake measurement scales to analyze wave behavior and magnitude – (K3)
3. Apply seismic instrumentation principles to interpret seismograms and distinguish between natural and man-made seismic events – (K3)
4. Select regional seismicity, seismic zonation, and micro zonation concepts along with major earthquake events in India and worldwide – (K3)
5. Apply statistical and analytical methods to earthquake data for interpretation and basic predictive modeling – (K3)
6. Identify seismic hazard analysis concepts, limitations of earthquake prediction, and applications in disaster management and early warning systems – (K3)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	-	-	1	-	2	3	1	-	-	2	2
C02	2	2	-	2	1	-	2	3	1	-	-	2	2
C03	2	2	-	-	1	-	2	3	1	-	1	2	2
C04	2	2	2	2	1	-	2	3	1	-	1	2	2
C05	2	2	2	-	1	-	2	3	1	-	1	2	2
C06	2	2	2	-	1	-	2	3	1	-	1	2	2

PROFESSIONAL ELECTIVES - I

COURSE CODE: 20CEEL505	STRUCTURAL SYSTEM IN ARCHITECTURE	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: 124105015	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 12				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To understand force systems, equilibrium, and basic strength of materials for structural applications.
- To study bending, shear, and column behavior in architectural structural design.
- To analyze beams, frames, and indeterminate structures used in buildings.
- To understand the behavior and applications of truss and space frame structures.
- To study arches, shells, domes, tensile, and plate structures in architecture.
- To introduce advanced structural systems, high-rise structures, and relevant IS codes.

MODULE - I STATICS AND STRENGTH OF MATERIALS**8**

Force systems and equilibrium, classification of structures, types of supports and reactions, structural framing and loading. Theory of elasticity, material properties, stress-strain relationship, shear force and bending moment in beams in architectural design.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.20

MODULE - II STRUCTURAL MECHANICS AND COLUMN THEORY 7

Bending stress and shear stress in beams. Theory of columns – short and long columns, Euler's theory, Rankine's formula, buckling behavior and applications in architectural design.

MODULE - III FRAME STRUCTURE ANALYSIS AND DESIGN 8

Deflection of beams using standard methods. Analysis of statically indeterminate structures. Structural frames – types and behavior. Application of different types of structural frames in architectural design.

MODULE - IV TRUSS AND SPACE FRAME STRUCTURES 7

Concept and classification of trusses. Analysis and applications of truss structures. Space frame systems – structural behavior, applications, and advantages in modern construction in architectural design.

MODULE - V ARCH, SHELL, DOME AND TENSILE STRUCTURES 8

Structural concept and behavior of arches, shells, and domes. Types, applications, and advantages. Tensile and plate structures – structural concept, materials used, applications, advantages, and case studies in architectural design.

MODULE - VI ADVANCED STRUCTURAL SYSTEMS 7

Pneumatic structures, tensegrity structures, temporary structures, and cost-effective structural systems. High-rise structural systems, foundation systems, and introduction to relevant IS code provisions.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2. Srinath, L.S., "PERT and CPM Principles and Applications", Affiliated East West Press, 2001

REFERENCES:

1. Structure as Architecture – Andrew W. Charleson, Structure as Architecture, Architectural Press, Elsevier, 2005.
2. Structural Systems and Concepts for Architects – Victor E. Saouma, Structural Systems and Concepts for Architects, University of Colorado Press, 2005.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

3. Structure and Architecture – Angus J. Macdonald, Structure and Architecture, Architectural Press, Elsevier, 2001.
4. Structural Elements for Architects and Builders – Jonathan Ochshorn, Structural Elements for Architects and Builders, Architectural Press, Elsevier, 2009.

REFERENCES:

1. Basic Structures for Engineers and Architects – Philip Garrison, Basic Structures for Engineers and Architects, Blackwell Publishing, 2005.
2. Structural Competency for Architects – Hollee Hitchcock Becker, Structural Competency for Architects, Routledge, 2014.
3. Structural Analysis and Design of Tall Buildings – B. S. Taranath, Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, CRC Press, 2010.
4. Tall Buildings Structural Systems and Aerodynamics – M. H. Gunel and H. E. Ilgin, Tall Buildings: Structural Systems and Aerodynamics, Routledge, 2014.

WEB REFERENCES:

1. Council on Tall Buildings and Urban Habitat – <https://www.ctbuh.org>
2. American Society of Civil Engineers – <https://www.asce.org>
3. Institution of Structural Engineers – <https://www.istructe.org>

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ar10

OUTCOMES:

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

1. Analyze force systems, structural components, and support conditions to determine reactions and load transfer mechanisms in buildings. (K4)
2. Analyze stresses, strains, shear forces, bending moments, and deflections in structural members using strength of materials principles. (K4)
3. Analyze the behavior of determinate and indeterminate frame structures under various loading conditions. (K4)
4. Analyze truss and space frame systems to evaluate structural efficiency and suitability for architectural applications. (K4)

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5. Analyze the structural behavior of arches, shells, domes, and tensile structures under different loading scenarios. (K4)
6. Analyze special and advanced structural systems including pneumatic, tensegrity, and high-rise structural systems for practical implementation. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	3	2	-	1	-	2	3	3	-	-	2	2
C02	2	3	2	-	1	-	2	3	3	-	-	2	2
C03	2	3	2	-	1	-	2	3	3	-	-	2	2
C04	2	3	2	-	1	-	2	3	3	-	-	2	2
C05	2	3	2	-	1	-	2	3	3	-	-	2	2
C06	2	3	2	-	1	-	2	3	3	-	-	2	2

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL506	OPTIMISATION METHOD FOR CIVIL ENGINEERING	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: 105103210	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11 & 15				
PRE-REQUISITE COURSES	24CEPC301, 24CEPC402					

OBJECTIVES:

- To explain the fundamentals of optimization and solve linear programming problems using simplex and Excel.
- To apply classical and gradient-based optimization methods to single- and multi-variable problems.
- To examine equality, inequality, and penalty-based approaches for constrained optimization problems.

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- To understand metaheuristic optimization concepts with emphasis on Genetic Algorithms and multimodal optimization.
- To implement Genetic Algorithms and evolutionary techniques using R for constrained and unconstrained problems.
- To solve single- and multi-objective optimization problems using MATLAB, R, and Excel software tools.

MODULE - I INTRODUCTION TO OPTIMIZATION**8**

Introduction to optimization, classical optimization, introduction to linear problem, general system of equations, simplex method, solution of linear problem using excel.

MODULE - II OPTIMIZATION METHODS**7**

Bracketing method, Region elimination method, Gradient based method and example, convex function, Line search method for multi variable problem

MODULE - III CONSTRAINED OPTIMIZATION**7**

Quadratic approximation method, Constrained optimization I: Equality constraints, Constrained optimization II: InEquality constraints, Constrained optimization III: Penalty function method

MODULE - IV METAHEURISTIC OPTIMIZATION**7**

Introduction to metaheuristic optimization, Genetic Algorithm (Part I), Genetic Algorithm (Part II), Genetic Algorithm (Part III), Real coded Genetic Algorithm, Multimodal optimization

MODULE - V GENETIC ALGORITHM**7**

Introduction to R, GA using R(un constrained problem), GA using R(Constrained problem), Constrained handling in Gas, Evolution strategies, Particle swarm optimization, Introduction to R.

MODULE - VI OPTIMIZATION USING SOFTWARE**9**

Multi objective genetic algorithm, introduction to differential evolution, introduction to matlab, optimization using matlab, A tutorial for differential evolution, NSGA II using R, optimization using Excel, Multi objective genetic algorithm using MATLAB, solution of design problem using MATLAB

TOTAL : 45 PERIODS

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

TEXT BOOKS

1. SS Rao Engineering optimization theory and practice, Wiley 2008.
2. S R Komaragiri and N Kumar Multicriterion Analysis in Engineering and Management, Prentice hall, 2010.

REFERENCES:

1. F Bennis and RK Bhattacharya nature inspired method for metaheuristic optimization algorithm and application in science and engineering Springer INC.
2. A D Betlegiundu and TR Chandru patla optimization concept and applications in engineering pearson education asia, 2002.

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105103210>

OUTCOMES:

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

1. Compare classical, algebraic, and spreadsheet-based optimization methods for linear programming problems (K4).
2. Assess the convergence and performance of bracketing, region-elimination, and gradient-based nonlinear search methods (K4).
3. Examine constrained optimization techniques to identify efficient methods for different constraint types (K4).
4. Investigate Genetic Algorithm performance with respect to selection, diversity, and parameter tuning (K4).
5. Evaluate R-based evolutionary algorithms for convergence, constraint handling, and robustness in engineering optimization (K4).
6. Compare MATLAB, R, and Excel solvers for single- and multi-objective optimization problems (K4).

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	-	-	2	-	-	3	2	-	-	2	2
C02	2	2	-	-	2	-	-	3	2	-	-	2	2
C03	2	2	-	2	-	-	-	3	2	-	-	2	2
C04	2	2	-	-	2	-	-	3	2	-	-	2	2
C05	2	2	-	-	2	-	-	3	2	-	-	2	2
C06	2	2	-	-	2	-	-	3	2	-	-	2	2

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL506	RENEWABLE ENERGY SYSTEM	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11, 12				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To Provide knowledge about various renewable energy technologies
- To enable students to understand and design a PV system
- To gain knowledge about various possible hybrid energy systems
- To gain knowledge about application of various renewable energy technologies

MODULE - I INTRODUCTION

8

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of Resources, Limitations of Resources, Present Indian and international energy scenario of conventional and Resources.

MODULE - II WIND ENERGY

7

Power in the Wind – Types of Wind Power Plants (WPPs)–Components of WPPs–Working of WPPs–Siting of WPPs–Grid integration issues of WPPs.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.20

MODULE - III SOLAR ENERGY

9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array, PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications

MODULE - IV BIO MASS ENERGY

7

Introduction-Biomass resources -Energy from Biomass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system

MODULE - V TIDAL ENERGY

7

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types – construction and applications. Energy Storage System- Hybrid Energy Systems

MODULE - VI ENERGY STORAGE, HYBRID SYSTEMS AND EMERGING TECHNOLOGIES

7

Energy storage systems, batteries and fuel cells, hydrogen energy systems, hybrid renewable energy systems, smart grids, integration challenges, economic analysis, recent advancements and future trends in renewable energy systems.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Twidell Weir, 'Renewable Energy Resources' CRC Press (Taylor & Francis).
2. Tiwari and Ghosal/Narosa, 'Renewable Energy Resources'.

REFERENCES

1. D.P.Kothari, K.C.Singhal, 'Renewable Energy Sources And Emerging Technologies', P.H.I. 2.D.S.Chauhan, S.K.Srivastava, 'Non-Conventional Energy Resources', New Age Publishers, 2006. 3.B.H.Khan, 'Non-Conventional Energy Resources', Tata McGrawHill, 2006.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

WEB RESOURCES:

1. <https://www.irena.org/>
2. <https://www.iea.org/topics/renewables>
3. <https://mnre.gov.in/>
4. <https://www.energy.gov/eere/renewable-energy>

ONLINE RESOURCES:

1. <https://online-learning.tudelft.nl/courses/>
2. <https://www.slideshare.net/>

OUTCOMES:

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

1. Apply the concepts of fossil fuel impacts and renewable energy sources to analyze sustainable design approaches and evaluate the Indian and global energy scenario. (K3)
2. Illustrate the working principles of wind power plants by using knowledge of their components, types, siting criteria, and grid integration challenges (K3)
3. Identify solar energy principles to evaluate solar thermal and photovoltaic systems, including radiation measurement, PV characteristics, and performance optimization techniques. (K3)
4. Apply biomass, geothermal, and small hydro energy systems by evaluating their conversion processes, components, and environmental benefits (K3)
5. Interpret the working principles of ocean energy systems, hydrogen energy, fuel cells, and hybrid systems to assess their feasibility and energy storage applications. (K3)
6. Select energy storage technologies, hybrid renewable energy systems, smart grid integration, and emerging advancements for sustainable and efficient energy management. (K3)

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CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL508	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105107213	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11, 13				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To understand the sources and effects of air pollution on health, ecosystems, and structures.
- To learn about air quality standards and monitoring techniques.
- To study the principles of control methods for gaseous and particulate pollutants.

MODULE - I INTRODUCTION TO AIR POLLUTION

7

Definition, Scope and Scales of Air Pollution and classifications of air pollutants - Sources and types of air pollutants - natural and anthropogenic - Effects of air pollution on human health, vegetation, and materials - Case studies on global and regional air pollution episodes (e.g., smog, acid rain).

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

MODULE - II AIR QUALITY STANDARDS AND MONITORING 8

Air quality criteria and national/international air quality standards - Air pollutant concentration measurement techniques - Air quality index (AQI) - Ambient air quality and stack monitoring techniques - Meteorological aspects - Atmospheric stability - Inversion - Wind profiles and stack plume patterns - Atmospheric Diffusion Theories - Dispersion models - Plume rise.

MODULE - III PARTICULATE POLLUTION AND CONTROL METHODS 7

Factors affecting Selection of Control Equipment - Working principle - gravitational settling chambers, cyclone separators - fabric filter - electrostatic precipitators (ESP) - Design principles of particulate control systems.

MODULE - IV CONTROL OF GASEOUS POLLUTANTS 8

Types of gaseous pollutants: SO_x, NO_x, CO, VOCs - Effects of gaseous pollutants on health and climate - Control techniques: absorption - adsorption - condensation - and combustion - elective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR).

MODULE - V POLICIES, REGULATIONS, AND MANAGEMENT 7

Introduction to Environmental Policies and Regulations - International Air Quality Standards - National and Regional Air Pollution Control Regulations - Air Quality Management Plans (AQMP) - Pollution Control Incentives and Penalties - Role of Local Government and Urban Planning - Climate Change and Air Quality Policies

MODULE - VI MODERN TECHNOLOGIES IN AIR POLLUTION CONTROL 8

Importance of modern technologies in mitigating air pollution - Advances in air quality monitoring: IoT-based systems and remote sensing - Introduction to carbon capture and storage (CCS) - Role of renewable energy in reducing air pollution - Emerging trends in vehicular emission control technologies (e.g., electric vehicles, hybrid systems).

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Wark, K., Warner, C.F., and Davis, W.T., "Air Pollution: Its Origin and Control," 3rd Edition, Pearson Education, New Delhi, 1998.
2. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., "Environmental Engineering," 1st Edition, McGraw- Hill Education, New Delhi, 1985.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

REFERENCES:

1. Vallero, D.A., "Fundamentals of Air Pollution," 5th Edition, Academic Press, San Diego, 2014.
2. Schnelle Jr., K.B., and Brown, C.A., "Air Pollution Control Technology Handbook," 1st Edition, CRC Press, Florida, 2002.
3. Cheremisinoff, N.P., "Handbook of Air Pollution Prevention and Control," 1st Edition, Butterworth-Heinemann, Oxford, 2002.
4. Rao, C.S., "Environmental Pollution Control Engineering," 2nd Edition, New Age International Publishers, New Delhi, 2006.

WEB REFERENCES:

1. <https://www.eea.europa.eu>
2. <https://www.who.int/health-topics/air-pollution>

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/105/106/105106119/>
2. <https://www.coursera.org/learn/air-pollution>
3. <https://www.edx.org/course/environmental-management-air-pollution>
4. https://www.youtube.com/channel/UC6yBS2A7W6FQ9eQPn_oMHEA

OUTCOMES:

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

1. Apply concepts of air pollution definitions, classifications, and sources (natural and anthropogenic) to analyse their effects on health, vegetation, and materials using relevant case studies. (K3)
2. Identify the types of gaseous pollutants, their health and climate effects, and describe control techniques like absorption, adsorption, condensation, combustion, SCR, and SNCR. (K3)
3. Apply principles to assess particulate matter (PM10, PM2.5), and use suitable control devices by interpreting their design and operational aspects. (K3)
4. Choose appropriate environmental policies and regulations to address real-world air pollution problems. (K3)
5. Utilize advanced air quality monitoring techniques and adapt mitigation methods for pollution control. (K3)

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6. Apply appropriate control techniques to solve air pollution problems in engineering practice. (K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	3	-	-	-	2	-	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	1	-	-	-	-	2	2
C04	3	-	-	-	-	2	1	-	-	-	-	2	2
C05	3	-	-	-	-	-	1	-	-	-	-	2	2
C06	3	-	-	-	-	-	-	2	-	-	-	2	2

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL509	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105103205	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11, 15				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To understand the sources, characteristics, legislation, and environmental impacts of municipal solid and hazardous wastes for sustainable waste management practices.
- To analyze and apply waste assessment methods, collection systems, and modern waste processing technologies for effective resource recovery and environmental compliance.
- To design and evaluate integrated waste management and safe disposal systems using advanced technologies and circular economy principles for sustainable development.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - I INTRODUCTION TO MUNICIPAL SOLID AND HAZARDOUS WASTE MANAGEMENT

7

Types and sources of solid and hazardous wastes - Need for solid and hazardous waste management - Elements of integrated waste management and roles of stakeholders - Salient features of Indian legislations on - Municipal solid waste - Hazardous waste - Biomedical waste - Lead-acid batteries, plastics, and fly ash - Circular economy approach in waste management - Financing waste management

MODULE - II WASTE CHARACTERIZATION AND SOURCE REDUCTION

8

Waste generation rates and variations - Composition, physical, chemical, and biological properties of solid waste - Hazardous characteristics and toxicity assessments (TCLP test, leaching studies) - Waste sampling and characterization plan - Source reduction, recycling, and reuse strategies AI, IoT, and data analytics for waste characterization - Waste exchange and industrial symbiosis

MODULE - III WASTE STORAGE, COLLECTION, AND TRANSPORTATION

7

Handling and segregation of wastes at the source - Storage and collection systems for municipal solid waste - Analysis and optimization of waste collection systems - Transfer stations: Need, location, and design - Smart waste management (sensor-based waste bins, GPS tracking) - Compatibility, labelling, and handling of hazardous wastes

MODULE - IV WASTE PROCESSING AND RESOURCE RECOVERY

8

Objectives of waste processing - Material separation and resource recovery technologies - Biological treatment (composting, anaerobic digestion) and chemical conversion, Thermal conversion technologies (incineration, pyrolysis, plasma gasification) - Emerging technologies - Waste-to-Hydrogen, Biochar, and Biofuels - Stabilization and solidification of hazardous waste - Treatment of biomedical waste and pharmaceutical waste disposal

MODULE - V WASTE DISPOSAL AND LANDFILL MANAGEMENT

8

Waste disposal methods: Incineration vs. landfilling - Landfill classification, types, and design - Site selection, operation, and maintenance of sanitary landfills - Secure landfills and landfill bioreactors - Leachate and landfill gas management - New Addition: Landfill mining and circular landfill concepts - Landfill closure, remediation, and post-closure monitoring.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - VI CASE STUDIES AND FIELD VISIT

Case Studies on Innovative Waste Management Solutions: Smart city waste management practices - Industrial co-processing of hazardous waste - Circular economy models in solid waste management - Best practices in biomedical waste disposal - Carbon credit benefits in waste-to-energy projects - Field Visit to Municipal solid waste treatment plant

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Cherry PM, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018
2. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management Science and Engineering, Butterworth -Heinemann, 2016

REFERENCES:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-GrawHill India, First edition, 2015.
2. William A. Worrell, P. Aarne Vesilind, Christian Ludwig, Solid Waste Engineering - A Global Perspective, 3rd Edition, Cengage Learning, 2017.
3. Michael D. LaGrega, Philip L. Buckingham, Jeffrey C. Evans and "Environmental Resources Management, Hazardous waste Management", McGraw Hill International edition, New York, 2010.
4. John Pichtel, Waste Management Practices, CRC Press, Taylor and Francis Group, 2014.
5. Gary C. Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010

WEB REFERENCES:

1. <https://datatopics.worldbank.org/what-a-waste/>
2. <https://www.unep.org/resources/global-waste-management-outlook-2024>

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/120108005/>
2. <https://nptel.ac.in/courses/105103205>
3. <https://www.coursera.org/learn/solid-waste-management>

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

OUTCOMES:**At the end of this course, the students should be able to:**

1. Apply knowledge to explain the types, sources, characteristics, and management needs of municipal solid and hazardous wastes, including Indian legislations, circular economy concepts, and financing mechanisms.(K3)
2. Make use of analytical methods to determine waste generation rates and characterize wastes using physical, chemical, biological, and toxicity assessment methods such as TCLP and leaching studies, and choose appropriate source reduction strategies.(K3)
3. Construct systems for waste storage, segregation, collection, transportation, and transfer stations using smart waste management technologies.(K3)
4. Select suitable waste processing and resource recovery technologies including biological, thermal, chemical, and emerging waste-to-energy solutions.(K3)
5. Develop safe and sustainable waste disposal systems such as sanitary and secure landfills, including leachate and landfill gas management, landfill mining, and post-closure monitoring.(K3)
6. Apply theoretical concepts to real-world waste management problems through case studies and field visits, and make use of innovative, circular, and sustainable waste management practices.(K3)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	2	-	-	-	-	2	2	2
C02	3	-	-	-	-	2	-	-	-	-	-	2	2
C03	3	-	-	-	-	-	1	2	-	-	-	2	2
C04	3	-	-	-	-	-	1	-	2	-	-	2	2
C05	3	-	-	-	-	-	1	-	-	-	2	2	2
C06	3	-	-	-	-	2	-	-	-	-	2	2	2

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL510	SUSTAINABLE ARCHITECTURE	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 124107011	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 12				
PRE-REQUISITE COURSES						

OBJECTIVES:

- Understand the fundamentals and principles of sustainability and sustainable development.
- Learn passive architectural design techniques for improving building comfort and efficiency.
- Gain knowledge about sustainable and green building concepts and assessment parameters.
- Understand site development and water conservation strategies in sustainable buildings.
- Study indoor environmental quality, sustainable materials, and energy-efficient building systems.
- Familiarize with building codes, vernacular architecture, and energy modelling tools used in sustainable design.

MODULE - I FUNDAMENTALS OF SUSTAINABLE ENVIRONMENT 8

Fundamentals and definitions of sustainability and sustainable development. Historical development of sustainability concepts. Sustainable architecture as a subset of sustainable development. Impacts of the built environment on the natural environment. Sustainable development initiatives – Agenda 21 and United Nations Sustainable Development Goals (SDGs).

MODULE - II PASSIVE ARCHITECTURAL DESIGN 7

Characteristics of sustainable architecture. Fundamentals of passive design. Basics of climatology. Thermal comfort, visual comfort, and acoustic comfort in buildings.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - III SUSTAINABLE AND GREEN BUILDINGS**7**

Concept of sustainable buildings. Parameters and indicators of sustainable buildings. Green buildings. Terminologies related to sustainable buildings – carbon footprint, life cycle assessment (LCA), and environmental impact indicators.

**MODULE - IV SITE DEVELOPMENT AND WATER CONSERVATION
STRATEGIES**
7

Site development principles – site selection, urban heat island (UHI) effect, public transport access, vegetation, development footprint, storm water runoff management, solar reflectance index (SRI). Water efficiency – estimation of water demand, reduction in consumption, recycling, reuse, landscape water requirements, strategies and technologies for water conservation.

MODULE - V INDOOR QUALITY, MATERIALS AND ENERGY**8**

Indoor Environmental Quality (IEQ) – daylighting, views, ventilation, thermal comfort, CFC-free systems, VOC-free materials. Materials and resources – segregation, recycling, waste reduction, reuse of materials and buildings, renewability. Energy efficiency and conservation in buildings, Energy Conservation Building Code (ECBC), renewable energy systems, measurement and verification (M&V).

**MODULE - VI CODES, VERNACULAR ARCHITECTURE AND ENERGY
MODELLING TOOLS**
7

Building codes and compliances – ECBC, National Building Code (NBC), and green building rating systems prevalent in India. Vernacular architecture and sustainability. Role of culture in sustainable development. Introduction to software tools for energy compliance and building performance analysis – Design Builder, Climate Consultant, and similar tools.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Sustainable Architecture, James Steele, McGraw-Hill, 1997.
2. Sustainable Building Design Manual, The Energy and Resources Institute (TERI), TERI Press, New Delhi, 2012.
3. Climate Responsive Architecture, Arvind Krishan, Nick Baker, Simos Yannas, Szokolay, Tata McGraw-Hill, 2001.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

REFERENCES:

1. Design with Climate: Bioclimatic Approach to Architectural Regionalism, Victor Olgyay, Princeton University Press, 1963.
2. Energy Efficient Buildings in India, Bureau of Energy Efficiency (BEE), Government of India, 2017.
3. The Green Studio Handbook, Alison G. Kwok, Walter T. Grondzik, Architectural Press, Elsevier, 2011.
4. Sustainable Construction: Green Building Design and Delivery, Charles J. Kibert, Wiley, 2016.

WEB REFERENCES:

1. United Nations Environment Programme, <https://www.unep.org>,
2. U.S. Green Building Council, <https://www.usgbc.org>,
3. Bureau of Energy Efficiency India, <https://beeindia.gov.in>
4. Ministry of Housing and Urban Affairs India, <https://mohua.gov.in>,
5. Building Materials and Technology Promotion Council, <https://bmtpc.org>

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ar10

OUTCOMES:

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

1. Explain the principles of sustainability and sustainable development to evaluate the impact of the built environment on natural systems. (K3)
2. Demonstrate climate-responsive and passive design strategies to improve thermal, visual, and acoustic comfort in buildings. (K3)
3. Assess sustainable building parameters and green building indicators to evaluate building performance. (K3)
4. Implement site planning and water conservation strategies to reduce environmental impact and resource consumption. (K3)
5. Utilize material selection, indoor environmental quality, and energy efficiency principles in sustainable building design. (K3)
6. Examine codes, rating systems, and basic energy simulation tools to check compliance with sustainability standards. (K3)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	-	-	-	2	-	-	-	-	-	-	2	-
C02	3	-	-	-	2	-	-	-	-	-	-	2	1
C03	3	-	-	-	2	-	-	-	-	-	3	3	2
C04	3	-	-	-	2	-	-	-	-	-	3	3	2
C05	3	-	-	-	2	-	-	-	-	-	-	3	2
C06	3	-	-	-	2	-	-	-	-	2	-	2	3

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL511	HOUSING POLICY & PLANNING	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 124107001	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES						
OBJECTIVES						

OBJECTIVES:

- To introduce the concepts, classifications, and present housing situation in India, including the role of housing policies, public intervention, and urban reforms.
- To provide an understanding of housing policies, legal and institutional frameworks, land management, affordability, housing finance, and government missions such as PMAY.
- To familiarize students with housing planning principles, development controls, and integration of housing with infrastructure and urban services.

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- To develop the ability to formulate housing strategies for cities, addressing core city areas, new housing zones, plotted housing, and group housing schemes.
- To impart knowledge on community development approaches in housing, including cooperative, institutional, rental housing, hostels, and serviced apartments.
- To sensitize students to informal housing typologies and special housing needs, including slums, squatters, disaster-resistant housing, housing management, and preparation of housing action plans.

MODULE - I INTRODUCTION TO HOUSING**7**

Introduction- Housing Classifications- Housing Situation-Policy and Public intervention- Urban Reform

MODULE - II HOUSING POLICY**7**

Housing Policy-Legal and Institutional Framework for Housing – Land for Housing – Affordability and Housing Finance – Technology Systems in Housing Delivery – Housing for All Mission (PMAY) and Technology Submission.

MODULE - III INTRODUCTION TO HOUSING PLANNING**8**

Urban and Regional Planning – Development Controls – Housing Infrastructure and Services- Transport and Roads, Drainage, Sanitation, Electricity and SWM, Social Infrastructure and Facilities

MODULE - IV HOUSING STRATEGY FOR CITY**7**

An Overview – Dealing with Core City Housing, Dealing with New Housing Areas – Planning for Plotted Housing – Planning for Group Housing

MODULE - V COMMUNITY DEVELOPMENT IN HOUSING**8**

Community Development in Housing – Cooperative Housing – Institutional and rental housing- Working Person's hostel and Serviced Apartments

MODULE - VI INFORMAL HOUSING TYPOLOGIES**8**

Approaches in Improving Slums and Squatters – Urban Village and Unauthorized Construction-Pavement Dwellers and Night Shelters – Old Age home – Disaster Resistant Housing – Housing and Real Estate Development – Housing Management – Housing : Action Plan.

TOTAL : 45 PERIODS

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

TEXT BOOKS

1. Susan J. Smith & Peter S. Onaka, Urban Housing Policy: The Role of Public Intervention, McGraw Hill, New York, 2012.
2. R. K. Jain & P. K. Das, Housing and Urban Development in India, Tata McGraw Hill Publishing Co., New Delhi, 2018.

REFERENCES

1. K. C. Sivaramakrishnan (Ed.), Urban India: Fifty Years of Planning, Policies, and Development, Oxford University Press, New Delhi, 2011.
2. B. S. Dwivedi, Housing and Urban Development: Policies, Issues & Practices, Vikas Publishing House, New Delhi, 2015.
3. Shiv R. Jat & S. K. Singh, Housing in India: Policies, Programmes and Practices, New Age International Publishers, New Delhi, 2020.
4. M. Mahadevia (Ed.), Inclusive Urban Planning: Housing, Water and Sanitation, Routledge India, New Delhi, 2017.

WEB RESOURCES:

1. <https://unhabitat.org/> — UN-Habitat (United Nations Human Settlements Programme): Global resources on housing, sustainable cities, slum upgrading, and urban planning policy frameworks.
2. <https://smartnet.niua.org/> — SmartNet (National Institute of Urban Affairs): Knowledge portal on urban planning, housing policy, infrastructure planning, GIS tools, and governance documents.
3. <https://pmay-urban.gov.in/> — Pradhan Mantri Awas Yojana (Urban): Official portal with policy documents, guidelines, mission updates, and technology submissions for affordable housing.

ONLINE RESOURCES:

1. <https://online-learning.tudelft.nl/courses/> — Delft University of Technology Open Courses: Courses on urban planning, housing policy, GIS, and sustainable cities.
2. <https://www.slideshare.net/> — SlideShare: Presentations and lecture slides on housing planning, urban infrastructure, policy frameworks, and case studies
3. <https://swayam.gov.in/> — SWAYAM: National online learning platform offering courses on urban planning, GIS, sustainable development, and housing policy.

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4. <https://ocw.mit.edu/courses/urban-studies-and-planning/> — MIT OpenCourseWare: Free courses and materials on urban studies, planning, housing markets, and infrastructure.
5. <https://www.coursera.org/> — Coursera: MOOCs on urban planning, sustainable cities, GIS mapping, and housing policy from global universities

OUTCOMES:

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

1. Apply housing concepts and classifications to analyze the housing situation in India, examine the role of policy, public intervention, and urban reforms in addressing housing challenges [K3]
2. Apply housing policies, legal and institutional frameworks, land management strategies, affordability concepts, and housing finance mechanisms including PMAY (K3)
3. Apply housing planning principles and development controls in integrating housing with infrastructure and urban services (K3)
4. Explain and apply housing planning strategies for core city redevelopment, new housing areas, plotted housing, and group housing schemes (K4)
5. Apply community development concepts in planning cooperative housing, institutional and rental housing, hostels, and serviced apartments (K3)
6. Develop housing action plans for informal settlements, disaster-resistant housing, and special housing needs using appropriate housing improvement strategies (K3)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	2	-	-	-	2	-	-	-	-	-	-	2	-
CO2	3	-	-	-	2	-	-	-	-	2	-	2	-
CO3	3	-	-	-	2	-	-	-	-	-	3	3	1
CO4	3	-	-	-	2	-	-	-	-	-	-	3	1
CO5	3	-	-	-	2	-	-	-	-	-	-	3	-
CO6	3	-	-	-	2	-	-	-	-	-	3	3	2

PROFESSIONAL ELECTIVES - I

COURSE CODE: 24CEEL512	INTRODUCTION TO URBAN PLANNING	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 124107158	SYLLABUS VERSION 1.0	SDG NO. 9, 11, 15				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- Introduce the fundamental concepts, need, objectives, and evolution of urban planning in the global and Indian context.
- Develop an understanding of urban issues such as land-use change, urban sprawl, housing problems, slums, and infrastructure challenges in Indian cities.
- Familiarize students with the urban planning framework, processes, and tools including surveys, data collection, GIS, mapping, and plan preparation.
- Impart knowledge on planning legislations, policies, governance structures, and institutional mechanisms for effective plan implementation.
- Enable students to understand the role of urban infrastructure and services in shaping urban form, livability, and sustainability.
- Promote awareness of sustainable urban planning principles and emerging trends such as smart cities, climate-resilient planning, GIS, and urban informatics.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29/4/26

MODULE -I FUNDAMENTALS OF URBAN PLANNING

7

Need and objectives of urban planning -Evolution of urban planning (historical, global and Indian context)- Characteristics of settlements (urban vs rural)- Types of plans (master plan, zonal plan, perspective plan) and the overall planning process -Basic terminologies: land use, density, urban form, built/un-built context.

MODULE -II URBAN ISSUES AND PROBLEMS

7

Land-use change and spatial growth of cities-Urban sprawl, sporadic growth, conurbation-Infrastructure and communication networks in urban areas-Slums, informal settlements, housing shortages and challenges-Urban growth pressures and challenges in Indian cities.

MODULE -III PLANNING FRAMEWORK, PROCESS & TOOLS

8

Planning framework: components, stakeholders, actors in urban planning - The planning process: data collection, surveying, GIS/ mapping basics-Preparation and implementation of various plans: master plan, zonal plan, perspective plan - Participatory & inclusive planning: stakeholder engagement, public participation.

MODULE -IV PLANNING LEGISLATION, POLICIES & GOVERNANCE

7

Legislation as tools of plan implementation and development (Indian legal/regulatory framework) -Review of planning legislation in India: acts, rules, local laws-Complaint and redress mechanisms, governance issues-Institutional mechanisms for urban planning: planning agencies, municipal governance.

MODULE -V URBAN INFRASTRUCTURE & SERVICES

8

Urban infrastructure: roads, transport, water supply, sanitation, drainage - Urban services: solid waste management, waste-water, storm water, parks & open spaces - The role of infrastructure planning in shaping urban form and sustainability - Case studies of infrastructure/service provision in cities.

MODULE -VI SUSTAINABLE URBAN PLANNING & EMERGING TRENDS

8

Principles of sustainable urban development: compact city, transit-oriented development, green infrastructure - Tools & strategies: smart cities, climate-resilient planning, informal settlement upgrading - Emerging trends: GIS in

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

urban planning, big data, urban informatics - Challenges and opportunities for Indian cities: rapid urbanisation, affordable housing, resilience.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi, 2002
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
4. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986

REFERENCES

1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
2. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
3. CMDA, Second Master Plan for Chennai, Chennai 2008

WEB RESOURCES

1. <https://www.nptelprep.in/courses/124107158>

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ar12/preview

OUTCOMES:

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

1. Identify fundamental concepts, terminologies, and types of urban planning and settlement characteristics [K3]
2. Apply knowledge of urban issues and growth patterns to understand challenges in cities.
3. Utilize planning tools and techniques such as data collection, GIS, and mapping in urban planning processes [K3]
4. Select appropriate planning frameworks, policies, and governance mechanisms for urban development [K3]

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5. Develop strategies for planning and managing urban infrastructure and services effectively [K3]
6. Plan sustainable urban development approaches using modern tools and emerging trends [K3]

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	2	-	-	-	-	-	-	1	-
C02	3	-	-	-	2	-	-	-	-	-	-	2	-
C03	3	-	-	-	2	-	-	-	-	2	-	-	3
C04	3	-	-	-	2	-	-	-	-	-	3	2	-
C05	3	-	-	-	2	-	-	-	-	-	-	3	-
C06	3	-	-	-	2	-	-	-	-	-	3	3	2

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL513	CONCRETE TECHNOLOGY	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105102012	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24CEPC304, 24CEPT401					

OBJECTIVES:

- To provide fundamental knowledge of constituent materials of concrete
- To impart an understanding of chemical and mineral admixtures
- To familiarize students with the principles of concrete mix proportioning
- To enable application of BIS methods for mix design as per latest standards
- To evaluate fresh and hardened properties of concrete
- To introduce various types of special concretes and their applications

MODULE - I CONSTITUENT MATERIALS

9

Cement – Types – Chemical composition – Hydration of cement – Properties and tests as per BIS specifications – Aggregates – Classification – Mechanical properties and tests – Grading requirements – Water – Quality requirements for concrete.

MODULE - II CHEMICAL AND MINERAL ADMIXTURES

9

Chemical admixtures – Accelerators – Retarders – Plasticizers – Superplasticizers – Waterproofing agents – Mineral admixtures – Fly ash – Silica fume – Ground granulated blast furnace slag (GGBS) – Metakaolin – Effects on fresh and hardened concrete properties.

MODULE - III PROPORTIONING OF CONCRETE MIX

9

Principles of mix proportioning – Properties influencing mix design – Physical properties of materials – Nominal mix and design mix – BIS method of mix design as per IS 10262:2019 – Mix design examples and case studies.

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MODULE - IV FRESH AND HARDENED PROPERTIES OF CONCRETE 5

Workability – Factors affecting workability – Tests for workability – Segregation and bleeding – Strength properties of hardened concrete – Compressive strength – Split tensile strength – Flexural strength – Stress-strain behaviour of concrete.

MODULE - V DURABILITY OF CONCRETE 4

Durability concepts – Factors affecting durability – Permeability – Water absorption – Corrosion of reinforcement – Sulphate and acid attack – Durability tests – Case studies.

MODULE - VI SPECIAL CONCRETES 9

Lightweight concrete – Foam concrete – Self-compacting concrete (SCC) – Vacuum concrete – High strength concrete – Fibre reinforced concrete (FRC) – Ferrocement – Ready-mix concrete (RMC) – SIFCON – Shotcrete – Polymer concrete – High-performance concrete (HPC) – Geopolymer concrete.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Concrete Technology by M.S. Shetty, S. Chand & Company Ltd., New Delhi, 2026.
2. Concrete Technology by M.L. Gambhir, Tata McGraw Hill Education, New Delhi, 2025.

REFERENCES:

1. Properties of Concrete by A.M. Neville, Pearson Education, 2019
2. Concrete Technology by Job Thomas, Cengage Learning India Pvt. Ltd., 2015.
3. Concrete: Microstructure, Properties and Materials by Mehta and Monteiro, McGraw Hill Education, Latest Edition.
4. Bureau of Indian Standards, IS 10262:2019 – Concrete Mix Proportioning Guidelines, New Delhi.
5. Bureau of Indian Standards, IS 456:2000 – Plain and Reinforced Concrete Code of Practice, New Delhi

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

ONLINE RESOURCES:

1. <https://archive.nptel.ac.in/courses/105/102/105102012/>
2. <https://archive.nptel.ac.in/courses/105/106/105106176/>

OUTCOMES:

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

1. Analyze and classify the properties, composition, and performance of different types of cement, aggregates, and water quality as per IS specifications (K4)
2. Examine and distinguish the effects of chemical and mineral admixtures on the fresh and hardened properties of concrete (K4)
3. Analyze and compare different concrete mix proportioning methods and evaluate mix design parameters using BIS procedures (K4)
4. Examine and test for the workability and strength characteristics of fresh and hardened concrete through standard testing methods (K4)
5. Analyze and inspect the durability properties of concrete including permeability, water absorption, and resistance to environmental effects (K4)
6. Compare and distinguish the properties, performance, and applications of various special concrete such as SCC, FRC, HPC, and geopolymer concrete (K4)

CO - PO, PSO MAPPING:

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

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL514	FIRE PROTECTION, SERVICES AND MAINTENANCE MANAGEMENT OF BUILDING	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105102176	SYLLABUS VERSION 1.0	SDG NO. 4, 9				
PRE-REQUISITE COURSES	24CEPC404					

OBJECTIVES:

- To introduce the fundamental concepts of fire protection
- To provide knowledge on planning and designing buildings for fire resistance and safety
- To develop an understanding of water supply systems and HVAC systems
- To familiarize students with flow behaviour in building pipe networks
- To impart knowledge on intelligent buildings and building maintenance management
- To enable students to understand methods for building evaluation

MODULE - I BASIC CONCEPTS OF FIRE PROTECTION 9

Concepts of Fire Protection, Fire Resistance, Introduction Process of Combustion, ventilation and fuel Process of Combustion controlled fire, Effect of Fire on Construction Materials

MODULE - II PLANNING AND DESIGN FOR FIRE RESISTANCE AND SAFETY 9

Design for Fire Resistance- Steel, Concrete, Fire safety - Urban Planning, Escape and Refuge, Internal planning, Detection and Suppression, Design of Lift systems: expected stops and floor of reversal – case studies. Simulation and arrangement & Escalators

MODULE - III WATER SUPPLY AND HVAC SYSTEMS 9

Water Supply System: Constant Demand, Variable Demand & Diversity Factor, Control Systems. Introduction to HVAC, Governing Equations for HVAC Process, Numerical Problem on HVAC System. Psychrometric Chart: Equation based Approach.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.6.26

MODULE - IV FLOW IN PIPE NETWORKS AND FIXTURE UNITS 4

Flow in Pipe Networks, Design of Water Supply Distribution System, Flow in Waste Water pipes.

MODULE - V BUILDING MAINTENANCE AND MANAGEMENT 5

Intelligent Building, Life cycle cost and basics of building maintenance, Stages of maintenance management, Planning for building maintenance, Periodicity of maintenance management, Estimation of repair cycle, building inspection, Planned and Ad-hoc maintenance

MODULE - VI EVALUATION OF BUILDINGS 9

Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey, effect of corrosion and alkali aggregate reaction, NDT testing, periodicity and economics of condition survey, interpretation of test results

TOTAL : 45 PERIODS

TEXT BOOKS

1. Markus, T.A. & Morris, E.N., "Building Climate and Energy" Pitman publishing limited. 1980.
2. Croome, J.D. & Roberts, B.M., "Airconditioning and ventilation of buildings vol-1". Pergamon press.

REFERENCES:

1. Bureau of Indian Standards, "HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989.
2. SP-35 (1987): Handbook of Water supply & drainage-BIS
3. N.B.C.-2016 BIS

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ce09/preview
2. https://digitalskills.iitmpravartak.org.in/course_details.php?courseID=60&cart=

OUTCOMES:

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

1. Analyze and examine the concepts of fire protection, combustion process, ventilation, and the effect of fire on construction materials (K4)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.6.26

2. Analyze and compare planning and design aspects for fire resistance and safety in buildings including escape systems, detection, and suppression methods. (K4)
3. Examine and analyze water supply systems and HVAC processes using governing equations and psychrometric relationships. (K4)
4. Analyze and distinguish the flow behavior in pipe networks and design aspects of water supply and wastewater systems. (K4)
5. Examine and classify building maintenance strategies including inspection, repair cycles, and maintenance management practices. (K4)
6. Analyze and interpret the condition and health of buildings using visual inspection, NDT methods, and evaluation of deterioration mechanisms. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	1
C02	3	2	-	-	2	-	-	2	-	-	-	3	2
C03	3	2	-	-	-	-	-	-	-	-	-	2	2
C04	3	1	-	-	-	-	-	-	-	-	-	2	1
C05	3	2	-	-	-	2	-	-	-	-	-	3	2
C06	3	2	-	-	-	-	1	-	-	-	-	3	2

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.6.20

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL515	DISASTER MANAGEMENT AND MITIGATION	L 3	T 0	P 0	CP 3	C 3
NPTL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11, 15				
PRE-REQUISITE COURSES	24BSCY201					

OBJECTIVES:

- Analyze the internal and external triggers of natural hazards—ranging from seismic and volcanic activity to soil erosion—to understand the mechanical processes behind both rapid-onset (tsunamis, cyclones) and slow-onset (droughts) disasters.
- Examine the causal links between environmental triggers and their consequences, specifically evaluating how sedimentation and land degradation disrupt hydrological systems and diminish global socio-economic stability.
- Appraise the effectiveness of global management frameworks and engineering-based interventions to formulate robust, policy-driven mitigation strategies tailored for high-risk geographical zones.
- Investigate the integration of emerging technologies (AI and Remote Sensing) to modernize disaster management, enhancing the precision of early warning systems and real-time environmental monitoring.

MODULE - I INTRODUCTION TO DISASTER 8

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - National disaster management - Disaster management framework - Disaster Management Cycle.

MODULE - II TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS 8

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

MODULE - III NATURAL DISASTER

7

Natural Disasters - Meaning and Nature - Types and effects of natural Disasters - Floods and Drought Disasters study - Cyclone and Earthquake Disasters study - Landslides and Avalanche Disaster study - volcanic eruptions, Heat and cold waves study - Climatic change and Global warming, - Sea level rise - Ozone depletion study.

MODULE - IV ANTHROPOGENIC DISASTER

7

Man Made Disasters - Nuclear disasters - Chemical disasters - Biological disasters - Building fire and coal fire - Forest fire and oil fire - Air pollution - Water pollution - Deforestation and Industrial waste water pollution.

MODULE - V APPROACHES IN DISASTER MANAGEMENT

7

Approaches- Pre- disaster stage preparedness - Preparing hazard zonation maps - Predictability/ forecasting & warning - Preparing disaster preparedness plan - Land use zoning - Preparedness through Information, education - Emergency Stage - Rescue training for search & operation - Relief and Assessment surveys - Post Disaster stage - Rehabilitation- Social Aspect - Economic Aspect and Environmental Aspect

MODULE - VI DISASTER MITIGATION

8

Meteorological observatory - Seismological observatory - Hydrology Laboratory - Industrial Safety inspectorate study - Technology in Disaster Management applications - Emergency Management Systems (EMS) in the Disaster Management Cycle - Remote Sensing in Disaster Management - Geographic Information Systems (GIS) in Disaster Management - Specific Case studies

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni
4. Natural Hazards & Disasters by Donald Hyndman & David Hyndman - Cengage Learning

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

REFERENCES:

1. The Environment as Hazards by Kates, B.I & White, G.F, Oxford Publishers, New York, 1978
2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000

WEB RESOURCES:

1. The National Institute of Disaster Management (NIDM) - India
2. UNDRR - PreventionWeb

ONLINE RESOURCES:

1. National Institute of Disaster Management (NIDM) - India
2. NPTEL / Swayam: Natural Hazards Course
3. PreventionWeb (by UNDRR)
4. FAO Global Soil Partnership

OUTCOMES:

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

1. Explain the natural hazards and its management, global warming, cyclones and tsunamis. (K4)
2. Differentiate types of hazards and different consequences of hazards. (K4)
3. Analyze about the earthquakes and volcanic eruptions and effects of earthquakes and mitigation measures (K4)
4. Explain about Endogenous Hazards and causes also on mitigation measures of cyclone, droughts etc., (K4)
5. Explain about soil erosion and its effects, and the sedimentation process. (K4)
6. Explain about the sedimentation process and environmental problems. Also Emerging approaches in Disaster Management. (K4)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-		2	-	-	-	-	1	2	2
C02	3	2	-	-		2	-	-	-	-	1	2	2
C03	3	2	-	-	2	3	-	-	-	-	2	3	1
C04	3	1	-	-	2	3	1	-	-	2	2	3	1
C05	3	2	-	-		3	2	-	-	-	1	1	1
C06	3	2	-	-	3	3	2	2	2	2	3	2	3

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL516	INTRODUCTION TO FEM	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105103210	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11, 15				
PRE-REQUISITE COURSES	24CEPC301, 24CEPC402					

OBJECTIVES:

- Basics of Finite Element Analysis.
- Available material models for structural materials, soils and interfaces/joints.
- Modeling of engineering systems and Soil-Structure Interaction (SSI).
- Importance of interfaces and joints on the behavior of engineering systems.
- Implementation of material model in finite element method and applications

MODULE-I INTRODUCTION

7

Introduction to Finite Element Methods: General Procedure - Engineering Applications - Stress and Equilibrium, Strain - Displacement relations. Stress-strain relations: Finite Elements: 1- Dimensional, 2 - Dimensional, 3- Dimensional & Interpolation Elements

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MODULE-II ONE DIMENSIONAL PROBLEM

8

One Dimensional Problems: 1-D Linear and 1-D Quadratic Elements - Finite element modeling, Coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

MODULE-III ANALYSIS OF TRUSS AND BEAM

7

Analysis of Trusses: Derivation of Stiffness Matrix for Plane Truss, Displacement of Stress Calculations. Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node beam element, Load Vector, Deflection.

MODULE-IV TWO DIMENSIONAL STRESS ANALYSIS

8

Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, Estimation of Load Vector, Stresses Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and numerical integration.

MODULE-V HEAT TRANSFER

7

Steady State Heat Transfer Analysis : one dimensional analysis of Slab, fin and two-dimensional analysis of thin plate.

MODULE-VI DYNAMIC ANALYSIS

8

Formulation of finite element model for dynamic analysis-Mesh generation techniques-Convergence requirements in FEM-Introduction to FEM software: ANSYS, ABAQUS, NASTRAN-Eigenvalue and eigenvector analysis of structures.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Finite Element Methods: Basic Concepts and applications, Alavala and Chenna kesava reddy, PHI learning, 2008.
2. Introduction to Finite Elements in Engineering by T. R. Chandrupatla and A. D. Belegundu, PHI learning, 3rd edition, 2009.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

REFERENCES:

1. An Introduction to the Finite Element Method, J. N. Reddy, McGraw Hill, 2020.
2. Finite Element Analysis, SS Bhavikatti, New Age International Publishers, 2021.
3. Introduction to Finite Element Analysis: A Textbook for Engineering Students S. Unnirishnan Nair and Somanath, Springer, 2023.

WEB RESOURCES:

1. <https://nptel.ac.in/courses/112106135>.
2. <https://archive.nptel.ac.in/content/storage2/courses/105105041/m111.pdf>.

ONLINE RESOURCES:

1. OpenLearn - Introduction to FEA: A free course introducing basic theory, FEA procedures, and structural analysis.
2. MATLAB Academy - Intro to FEA: Teaches modelling, meshing, material properties, and boundary conditions using the PDE Toolbox.
3. Open Michigan - Introduction to FEM: Focuses on the mathematical foundation (variational calculus) and coding, designed for developing finite element code.

OUTCOMES:

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

1. Analyze finite element formulations for 1D, 2D, and 3D structural elements (K4).
2. Develop and analyze 1D finite element models with shape functions and global stiffness assembly (K4).
3. Evaluate truss and beam element behavior using stiffness matrices and stress calculations (K4).
4. Analyze 2D stress problems using CST, axisymmetric, and isoparametric elements (K4).
5. Apply finite element methods to steady-state heat transfer problems (K4).
6. Evaluate dynamic and 3D finite element models using mass matrices, eigen analysis, and software tools (K4).

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01	2	2	-	2	2	-	-	3	2	-	-	2	2
C02	2	2	-	2	2	-	-	3	2	-	-	2	2
C03	2	2	-	2	2	-	-	3	2	-	-	2	2
C04	2	2	-	2	2	-	-	3	2	-	-	2	2
C05	2	2	-	2	2	-	-	3	2	-	-	2	2
C06	2	2	-	2	2	-	-	3	2	-	-	2	2

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL517	MASONRY STRUCTURES	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105106197	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To understand the properties, behaviour, and types of masonry materials and construction techniques.
- To study design considerations of masonry elements including walls, openings, and load distribution.
- To analyze strength, stability, and failure mechanisms of masonry under different loading conditions.
- To learn structural design of masonry structures including seismic effects and code-based design procedures.
- To develop knowledge of assessment, repair, and retrofitting techniques for existing masonry structures.

MODULE - I MASONRY CONSTRUCTION

8

Brick, stone and block masonry units – strength, modulus of elasticity and water absorption of masonry materials –classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - II DESIGN CONSIDERATIONS

8

Effective height of walls, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels

MODULE - III STRENGTH AND STABILITY

8

Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, strength formulae and mechanism of failure for masonry subjected to direct compression..

MODULE - IV STRUCTURAL DESIGN OF MASONRY AND SEISMIC LOADS

7

Structural design of masonry - Consideration of seismic loads - Cyclic loading and ductility of shear walls for seismic design.

MODULE - V DESIGN OF MASONRY WALLS

7

Design of load bearing masonry for building up to 3 storeys using IS: 1905 and SP: 20 procedure

MODULE - VI RETROFITTING OF MASONRY

7

Seismic evaluation and retrofit of masonry - In-situ and non-destructive tests for masonry - Properties - Repair and strengthening techniques.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Hendry A.W., Sinha B.P., Davies S.R., "Design of Masonry Structures", 3rd Edition, CRC Press, Taylor & Francis Group, London, 2017.
2. McKenzie William, "Design of Structural Masonry", 1st Edition, Bloomsbury Publishing, London, 2001.
3. IS 1905 : 1987 - Unreinforced Masonry - Code of Practice
4. SP 20 : 1991 - Handbook on Masonry Design and Construction
5. IS 4326 : 2013 - Earthquake Resistant Design and Construction of Buildings
6. IS 1893 (Part 1) : 2016 - Criteria for Earthquake Resistant Design of Structures

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

REFERENCES:

1. Drysdale R. G., Hamid A. H. and Baker L. R., "Masonry Structures: Behaviour & Design", Prentice Hall Hendry, 1994
2. R. S. Schneider and W. L. Dickey, "Reinforced Masonry Design", Prentice Hall, 3rd edition, 1994.
3. Paulay T. and Priestley M. J. N., "Seismic Design of Reinforced Concrete and Masonry Buildings", John Wiley, 1992
4. W. Hendry, "Structural Masonry", 2nd Edition, Palgrave Macmillan Press, 1998.

WEB RESOURCES:

1. <https://youtu.be/bGjPOoQGcRw?si=fMi79Vkl1sPt0ilp>
2. <http://kcl.digimat.in/nptel/courses/video/105106197/L22.html>
3. https://youtu.be/GVL9dybHXn4?si=u0n9gJ8Vr_7EAwDB

ONLINE RESOURCES:

1. <https://studentsfocus.com/ce6702-pcs-notes-prestressed-concrete-structures-lecture-handwritten-notes-civil-7th-sem-anna-university/>
2. <https://lecturenotes.in/subject/245/prestressed-concrete-structures-pcs>

OUTCOMES:

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

1. Examine the properties of a masonry unit and the various components.(K4)
2. Simplify the masonry structure for compression.(K4)
3. Analyse a masonry structure for lateral loads.(K4)
4. Discover the Structural Design of Masonry and Seismic Loads.(K4)
5. Inspect Seismic Design and Modeling Techniques.(K4)
6. Analyse retrofitting techniques for existing masonry walls.(K4)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	3	2	-	1	-	2	3	3	-	-	2	2
C02	2	3	2	-	1	-	2	3	3	-	-	2	2
C03	2	3	2	-	1	-	2	3	3	-	-	2	2
C04	2	3	2	-	1	-	2	3	3	-	-	2	2
C05	2	3	2	-	1	-	2	3	3	-	-	2	2
C06	2	3	2	-	1	-	2	3	3	-	-	2	2

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL518	STRUCTURAL HEALTH MONITORING	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 114106046	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 12				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To introduce fundamentals and importance of Structural Health Monitoring (SHM).
- To provide knowledge of sensors and instrumentation used in SHM systems.
- To understand static and dynamic measurement techniques for structural assessment.
- To familiarize damage detection methods using vibration and wave propagation.
- To develop knowledge of advanced data processing and analysis techniques.
- To expose applications and case studies of SHM in civil infrastructure.

MODULE - I INTRODUCTION TO STRUCTURAL HEALTH MONITORING**8**

Need for SHM, Structural Health Monitoring versus Non-Destructive Evaluation, Methods of SHM Local & Global Techniques for SHM, Short & Long-

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

Term Monitoring, Active & Passive Monitoring, Remote Structural Health Monitoring- Advantages of SHM - Challenges in SHM

MODULE - II SENSORS AND INSTRUMENTATION FOR SHM 8

Sensors for measurements: Electrical Resistance Strain Gages, Vibrating Wire Strain Gauges, Fiber Optic Sensors, Temperature Sensors, Accelerometers, Displacement Transducers, Load Cells, Humidity Sensors, Crack Propagation Measuring Sensors, Corrosion Monitoring Sensors, Pressure Sensors, Data Acquisition - Data Transmission - Data Processing - Storage of processed data - Knowledgeable information processing

MODULE - III STATIC & DYNAMIC MEASUREMENT TECHNIQUE FOR SHM 8

Static measurement - Load test, Concrete core trepanning, Flat jack techniques, Static response measurement, Dynamic measurement -Vibration based testing- Ambient Excitation methods, Measured forced Vibration- Impact excitation, step relaxation test, shaker excitation method.

MODULE - IV DAMAGE DETECTION 8

Damage Diagnostic methods based on vibrational response- Method based on modal frequency/shape/damping, Curvature and flexibility method, Modal strain energy method, Sensitivity method, Baseline-free method, Cross-correlation method, Damage Diagnostic methods based on wave propagation Methods-Bulk waves/Lamb waves, Reflection and transmission, Wave tuning/mode selectivity, Migration imaging, Phased array imaging, Focusing array/SAFT imaging

MODULE - V DATA PROCESSING 8

Advanced signal processing methods -Wavelet, Hilbert-Huang transform, Neural networks, Support Vector Machine Principal component analysis, Outlier analysis.

MODULE - VI CASE STUDIES 5

Applications of SHM for bridges, buildings, and civil infrastructure, case studies of SHM in Civil/ Structural engineering.

TOTAL : 45 PERIODS

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

TEXT BOOKS

1. Structural Health Monitoring - Daniel J. Inman, Charles R. Farrar, Vicente Lopes Jr., and Keith Worden, Structural Health Monitoring: A Machine Learning Perspective, Wiley, 2012.
2. Health Monitoring of Structural Materials and Components - D. Balageas, C. P. Fritzen, A. Güemes, Structural Health Monitoring, ISTE / Wiley, 2006.
3. Structural Health Monitoring of Civil Infrastructure Systems - Jerome P. Lynch & Kenneth J. Loh, Structural Health Monitoring of Civil Infrastructure Systems, CRC Press, 2007.

REFERENCES:

1. Vibration-Based Structural Health Monitoring - S. W. Doebling, C. R. Farrar, M. B. Prime, D. W. Shevitz, Los Alamos National Laboratory Report, 1998.
2. Non-Destructive Evaluation of Civil Structures - J. H. Bungey, S. G. Millard, M. G. Grantham, Testing of Concrete in Structures, CRC Press, 2006.
3. Smart Materials and Structures - G. R. Tomlinson & M. S. Rao, Smart Materials and Structures, Wiley, 2010.
4. Wavelet Transform in SHM - W. J. Staszewski, C. Boller, G. R. Tomlinson, Health Monitoring of Aerospace Structures, Wiley, 2004.

WEB REFERENCES:

1. <https://www.lanl.gov/projects/structural-health-monitoring>
2. <https://www.ishmii.org>
3. <https://highways.dot.gov>

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/114106046>
2. <https://www.nasa.gov>

OUTCOMES:

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

1. Explain the need, concepts, advantages, and challenges of Structural Health Monitoring (SHM) and differentiate it from Non-Destructive Evaluation techniques. (K4)
2. Identify and select appropriate sensors and instrumentation systems for measuring various structural parameters. (K4)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

3. Apply static and dynamic measurement techniques to evaluate structural response under different loading conditions. (K4)
4. Analyze structural damage using vibration-based and wave propagation-based diagnostic methods. (K4)
5. Process and interpret SHM data using advanced signal processing and machine learning techniques. (K4)
6. Evaluate real-world SHM applications and case studies in civil infrastructure systems. (K4)

CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL519	ENVIRONMENTAL IMPACT ASSESSMENT	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: 124107160	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 11				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To comprehend the principles, methodologies, and regulatory frameworks of Environmental Impact Assessment (EIA).
- To gain knowledge of environmental and social impacts of developmental projects and formulate appropriate mitigation strategies.
- To develop insights into techniques for conducting baseline studies, impact prediction, and cost-benefit analysis.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE -I INTRODUCTION

7

Sustainable Development- Environmental Impact Assessment (EIA) : Objectives, elements of EIA, Types and limitations of EIA - Historical development of Environmental Impact Assessment (EIA)- EIA in Project Cycle- Types and limitations of EIA – Legal and Regulatory aspects in India- Selection & Registration Criteria for EIA Consultants -Stakeholders and their Role in EIA.

MODULE -II ENVIRONMENTAL ASSESSMENT

8

Screening and Scoping in EIA – Drafting of Terms of Reference - Baseline monitoring, preparation of Environmental base map- Environmental indicators - Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna.

MODULE -III EIA METHODOLOGIES

7

Criteria for selection of EIA methodology, EIA method: Matrix method, Networks- check list methods – Mathematical model for predication analysis- Alternatives.

MODULE -IV ENVIRONMENTAL MANAGEMENT PLAN

8

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan –EIA Report Preparation – Review of EIA Reports – Environmental Clearance – Post Project Audit -stages and onsite activities.

MODULE -V SOCIO-ECONOMIC ASSESSMENT

7

Baseline monitoring of Socio-economic environment – Collection and interpretation of baseline data for various environmental attributes of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis- Public Consultation.

MODULE -VI CASE STUDIES

7

EIA case studies: Roads and Bridges –metro railways - Ports and Harbor – Airports - Dams and Irrigation projects – Mining Projects.

TOTAL : 45 PERIODS

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

TEXT BOOKS

1. Canter, R.L, "Environmental impact Assessment", 2nd Edition, McGraw Hill Inc., NewDelhi, 1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu., "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank, 1997.
3. Peter Morris, Riki Therivel, "Methods of Environmental Impact Assessment", Routledge Publisher, 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

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ar07/preview
2. <https://www.iisd.org/learning/eia/>
3. <https://www.open.edu/openlearn/nature-environment/organisations-environmental-management-and-innovation/content-section-2.8>

ONLINE RESOURCES:

1. <https://www.youtube.com/watch?v=fPegn9PM-4o>
2. <https://www.youtube.com/watch?v=9db5-s8L5t4>

OUTCOMES:

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

1. Examine the principles, objectives, elements, and legal framework of EIA, including its role in project cycles. (K4)

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2. Categorize screening and scoping techniques, environmental base maps, and impact prediction on environmental components. (K4)
3. Compare different EIA methodologies such as matrix methods, checklists, networks, and mathematical models for impact prediction. (K4)
4. Inspect the effectiveness of environmental mitigation strategies, monitoring plans, and regulatory procedures for impact management. (K4)
5. Classify socio-economic impacts, rehabilitation and resettlement planning, and cost-benefit aspects of environmental projects. (K4)
6. Distinguish key methodologies and findings from EIA case studies related to infrastructure, transportation, and industrial projects. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	2
C02	3	2	-	-	-	2	-	-	-	-	-	2	2
C03	3	2	-	-	2	-	-	-	-	-	-	2	2
C04	3	1	-	-	-	-	2	-	-	-	-	2	2
C05	3	2	-	-	-	-	-	-	2	-	-	2	2
C06	3	2	-	-	-	-	-	-	-	-	2	2	2

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL509	HYDROLOGY AND WATER RESOURCE ENGINEERING	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: -	SYLLABUS VERSION 1.0	SDG NO. 4, 6, 9, 11				
PRE-REQUISITE COURSES	24CEPC302					

OBJECTIVES:

- To acquire a fundamental understanding of surface and groundwater hydrology, including precipitation, runoff, infiltration, and well hydraulics for effective water resource management.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

- To comprehend reservoir planning, flood management strategies, water conservation techniques, and groundwater recharge methods for sustainable water utilization
- To gain insights into advanced tools such as remote sensing and GIS for hydrologic modelling, water quality assessment, and performance evaluation of irrigation systems

MODULE - I SURFACE WATER HYDROLOGY

8

Hydrologic cycle, - Global water budget - Climate and water availability - Water balances - Precipitation: rainfall and its measurement, -mean rainfall, runoff- Flow measurements-Infiltration losses, Storm hydrology: Unit Hydrograph; Storm hydrograph.

MODULE - II GROUNDWATER & WELL HYDRAULICS

8

Occurrence and movement of groundwater, Darcy's law, governing ground water flow equations, Factors governing ground water flow, Types of aquifers, porosity, specific yield, specific retention, storage coefficient, permeability, hydraulic conductivity, hydraulic transmissibility, Conjunctive use and it's necessity

MODULE - III RESERVOIR

6

Types, Investigations, Site selection, Zones of storage, Safe yield, Reservoir capacity, Reservoir sedimentation and control.

MODULE - IV FLOOD MANAGEMENT AND HYDROLOGIC ANALYSIS

8

Indian rivers and floods- Causes of flooding- Alleviation- Levees and floodwalls Floodways-Channel improvement- Flood damage analysis Flood estimation - Flood routing through reservoirs and open channels, Storm drainage design.

MODULE - V WATER HARVESTING

7

Water harvesting: rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks, natural and artificial ground water recharge methods

MODULE - VI REMOTE SENSING AND GIS FOR WATER RESOURCES

8

Spatial data sources - 4M GIS approach water resources system - Thematic maps - Rainfall-runoff modelling - Groundwater modeling - Water quality

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

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Board of Studies
Civil Engineering

modeling - Drought monitoring -Performance evaluation of irrigation commands.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Subramanya K., "Hydrology, Tata McGraw Hill Co., New Delhi, 1994.
2. Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008, 2nd Edition, New Delhi.
3. Jeya Rami Reddy.P, "Hydrology, Laximi Publications, New Delhi, 2004, 2009.

REFERENCES:

1. Wurbs R.A., and James W.P. "Water Resources Engineering". Prentice Hall of India, Eastern Economic Edition. ISBN: 81-203-2151-0, New Delhi, 2007.
2. Ian Heywood Sarah, Cornelius and Steve Carver "An Introduction to Geographical Information Systems". Pearson Education. New Delhi, 2002.
3. Lillesand, T.M. and Kiefer, R.W., "Remote Sensing and Image Interpretation" 3rd Edition. John Wiley and Sons, New York. 1993.
4. Chaturvedi. M.C., "Water Resources Systems Planning and Management". Tata McGraw Hill, New Delhi, 1997.

WEB RESOURCES:

1. <https://archive.nptel.ac.in/courses/105/105/105105110/>
2. <https://ocw.tudelft.nl/wp-content/uploads/Hydrology-of-catchments-hfdst-1.pdf>
3. https://onlinecourses.nptel.ac.in/noc24_ce10/preview

ONLINE RESOURCES:

1. <https://www.classcentral.com/course/youtube-civil-water-resources-engineering-47681>
2. <https://hydro.vwrrc.vt.edu/videos-and-online-resources-for-teaching-hydrology/>

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29/4/26

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 Civil Engineering

OUTCOMES:

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

1. Examine the hydrologic cycle, precipitation measurement, runoff processes, infiltration losses, and storm hydrograph analysis. (K4)
2. Categorize groundwater occurrence, flow mechanisms, aquifer properties, and factors influencing groundwater movement and conjunctive use. (K4)
3. Compare reservoir types, site selection criteria, storage zones, capacity estimation, and sedimentation control measures. (K4)
4. Inspect flood causes, management techniques, flood estimation, routing methods, and storm drainage design. (K4)
5. Classify water harvesting methods including runoff collection, storage systems, and groundwater recharge techniques. (K4)
6. Distinguish remote sensing and GIS applications in rainfall-runoff modeling, groundwater analysis, water quality assessment, and irrigation performance evaluation. (K4)

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	2	1
C02	3	2	-	-	-	-	1	-	-	-	-	2	1
C03	3	2	-	-	-	-	1	-	-	-	-	2	1
C04	3	1	-	-	-	2	-	-	1	-	-	2	1
C05	2	2	-	-	-	-	-	2	1	-	-	2	1
C06	2	2	-	-	-	-	-	2	1	-	2	2	2

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL521	INTEGRATED WASTE MANAGEMENT FOR A SMART CITY	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: 105105160	SYLLABUS VERSION 1.0	SDG NO. 9, 11, 12				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- To understand the sources, composition, characteristics, and regulations related to Municipal Solid Waste (MSW), Construction & Demolition (C&D) waste, and E-waste
To explore off-site waste processing methods along with an understanding of the MSW Rules 2016.
- To examine modern and sustainable waste management practices, including circular economy approaches and real-world case studies

MODULE -I INTRODUCTION

7

Municipal Solid Waste Sources; composition- generation rates Swachh Bharat Mission and Smart Cities Program- Current Issues in Solid Waste Management and Review of MSW Management Status in First List of 20 Smart Cities in the Country.

MODULE -II CHARACTERISTICS AND FUNDAMENTALS

8

Municipal Solid Waste-Characteristics and Quantities- Collection, Transportation, Segregation and Processing.

MODULE -III OFF-SITE PROCESSING

7

Landfill- Biochemical Processes and Composting- Energy Recovery from Municipal Solid Waste- Municipal Solid Waste (MSW) Rules 2016.

MODULE -IV CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT

8

Overview of C&D Waste – Sources, Effects, and Regulations- Beneficial -Reuse of C&D Waste Materials.

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - V ELECTRONIC WASTE (E-WASTE) MANAGEMENT 7

Sources- Effects, Issues and Status in India and globally- controlling measures- E-Waste Management Rules 2016 and Management Challenges.

MODULE - VI CASE STUDIES 7

Case Study of Circular Economy Solutions- Case Study in Waste Monitoring and Management – case studies of smart waste management systems.

TOTAL : 45 PERIODS**TEXT BOOKS**

1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, "Integrated Solid Waste Management", Tata McGraw Hill, 1993.
2. "Municipal Solid Waste Management Rules 2016", Central Pollution Control Board, Govt. of India, 2016.

REFERENCES:

1. William A Worrell and P. Aarne Vesilind Solid Waste Engineering, 2nd Edition (SI Edition) Cengage Learning, 2012 (ISBN-13: 978-1-4390-6217-3).
2. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization (CPHEEO), India.
3. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ar07/preview
2. <https://www.iisd.org/learning/eia/>
3. <https://www.open.edu/openlearn/nature-environment/organisations-environmental-management-and-innovation/content-section-2.8>

ONLINE RESOURCES:

1. <https://www.youtube.com/watch?v=fPegn9PM-4o>
2. <https://www.youtube.com/watch?v=9db5-s8L5t4>

OUTCOMES:

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

1. Identify the sources, composition, and generation trends of Municipal Solid Waste (MSW) and their relevance to urban waste management initiatives. (K3)

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

2. Organize the fundamental aspects of MSW characteristics, collection, transportation, segregation, and processing techniques. (K3)
3. Utilize knowledge of landfilling, biochemical waste processing, composting, and energy recovery methods while interpreting the MSW Rules 2016. (K3)
4. Select the sources, effects, and regulations of Construction & Demolition (C&D) waste, and propose beneficial reuse strategies. (K3)
5. Develop solutions for E-Waste management, including regulatory aspects of the E-Waste Management Rules 2016 at national and global levels. (K3)
6. Make use of real-world case studies on smart waste management systems and circular economy solutions for effective waste monitoring and resource recovery. (K3)

CO - PO, PSO MAPPING:

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

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL522	REMOTE SENSING AND GIS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105103193	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 13				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- Develop a foundation in remote sensing, including electromagnetic radiation, energy interactions, and sensors/platforms for data acquisition

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

- Learn types of remote sensing satellites, resolutions, and image processing techniques such as classification, enhancement, and vegetation indices
- Explore GIS concepts, data models, spatial analysis, and applications in land use, water resources, environment, and urban development.

MODULE - I INTRODUCTION TO REMOTE SENSING

8

Definition- Historical background – Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors – Active and passive remote sensing interference – Atmospheric effects on remote sensing – Energy interaction with earth surface feature – Data acquisition – Reflectance, spectral signatures for water, soil and vegetation

MODULE - II SATELLITES

7

Satellites – Types – Sun synchronous – Geo synchronous remote sensing satellites LANDSAT, SPOT & IRS – Resolution – Spectral, spatial, radiometric and Temporal Resolution - Recent satellites with its applications.

MODULE - III DATA PRODUCTS AND IMAGE ANALYSIS

8

Data products based on level of processing - Output – Scale – Area/Coverage – data availability – data ordering – data price – Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.

MODULE - IV CONCEPT OF GIS

7

Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.

MODULE - V DATA INPUT AND ANALYSIS

8

Spatial and non-spatial data – Database models – Hierarchical network, Relational and Object Oriented Data Models – Raster and Vector – Data input – Data Editing – Files and formats – Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

MODULE - VI APPLICATION OF REMOTE SENSING AND GIS

7

Applications - Land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management - Location based services and its applications

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Anji Reddy, M, Remote Sensing and Geographical Information Systems, BS Publications, Hyderabad, 2001
2. Lillesand, T. M., and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2000.

REFERENCES:

1. Bettinger, P., and Michael, G.W., "Geographical Information System: Applications in Forestry and Natural Resources Management," Tata McGraw-Hill Higher Education, New Delhi, 2003
2. Ian Heywood., "An Introduction to GIS", Pearson Education, New Delhi, 2001.
3. Jeffery Star and John Estes, "Geographical Information System - An Introduction," Prentice Hall India Pvt. Ltd., New Delhi, 1998.
4. Patel A.N & Surendra Singh, "Remote sensing principles & applications", Scientific Publishers, Jodhpur 1992.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc22_ce84/preview

ONLINE RESOURCES:

1. https://gis-lab.info/docs/books/aerial-mapping/cr1557_15.pdf

OUTCOMES:

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

1. Utilize remote sensing principles to interpret spectral signatures of water, soil, and vegetation [K3]
2. Select suitable satellites, sensors, and resolutions for geospatial applications [K3]

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

3. Experiment with and model image processing techniques for geospatial information extraction [K3]
4. Apply GIS concepts, map projections, coordinate systems, and spatial data sources to develop and manage geospatial databases for spatial analysis. [K3]
5. Model and solve spatial problems using GIS techniques such as buffering, overlay, and interpolation [K4]
6. Utilize GIS and remote sensing techniques to solve applications in land use, water resources, and urban planning [K3]

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	2	-	-	-	-	-	-	1	2
C02	3	-	-	-	2	-	-	-	-	3	-	1	3
C03	3	-	-	-	2	-	-	-	-	-	-	1	3
C04	3	-	-	-	2	-	-	-	-	-	3	1	3
C05	3	-	-	-	2	-	-	-	-	-	-	2	3
C06	3	-	-	-	2	-	-	-	-	-	3	3	3

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL523	REMOTE SENSING: PRINCIPLES AND APPLICATIONS	L	T	P	CP	C
		3	0	0	3	3
NPTEL CODE: 105101206	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 13				
PRE-REQUISITE COURSES	-					
OBJECTIVES						

OBJECTIVES:

- Build understanding of remote sensing fundamentals, including EMR, radiometric properties, and surface-atmosphere interactions
- Learn remote sensing platforms, sensor types, resolutions, and basic image processing techniques
- Explore applications in LULC, water resources, disaster assessment, and environmental studies using GIS

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29-4-26

**MODULE - I FUNDAMENTALS OF REMOTE SENSING AND
ELECTROMAGNETIC RADIATION**

8

Introduction to Remote Sensing – History and Development – Electromagnetic Radiation and Spectrum Divisions – Energy Sources and Radiation Principles – Basic Laws of Radiometry and Radiometric Quantities – Interaction of EMR with the Atmosphere: Atmospheric Windows, Scattering Mechanisms, and Aerosol Effects

**MODULE - II REMOTE SENSING DATA ACQUISITION AND RADIOMETRIC
CORRECTIONS**

7

Radiation to sensor – Path of EMR and atmospheric effects (scattering, absorption, transmission) – Radiance to reflectance conversion and basic corrections – Radiometric and geometric corrections – Remote sensing data acquisition: passive and active systems, platforms – Types of systems: optical, thermal, microwave – Sensor types and resolutions (spatial, spectral, temporal, radiometric) – Newmark's chart and its role in data analysis

**MODULE - III SPECTRAL CHARACTERISTICS AND RESOLUTION IN
REMOTE SENSING**

8

Spectral reflectance curves and factors affecting reflectance – Spectral signatures of vegetation, soil, and water in Visible, NIR, and SWIR bands – Influence of external factors on spectral response – Spectral indices: Definition, importance, and applications – Common indices like NDVI, NDWI, and NDBI – Applications in environmental monitoring and land cover classification

**MODULE - IV THERMAL AND MICROWAVE REMOTE SENSING:
PRINCIPLES AND APPLICATION**

7

Thermal Infrared Remote Sensing – Thermal radiation principles, blackbody radiation, emissivity – Thermal sensors and applications (land surface temperature, urban heat islands) – Passive microwave remote sensing: brightness temperature and surface interaction – Applications in soil moisture and snow monitoring – Active microwave remote sensing: radar and SAR principles – Radar backscatter and interaction with terrain features – SAR data interpretation and applications in flood mapping and disaster management

MODULE - V REMOTE SENSING PLATFORM AND DATA PROCESSING

8

Platforms for remote sensing observations – Ground-based, airborne, and satellite platforms – LIDAR principles, data acquisition, and applications –

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Common remote sensing datasets and data portals – Free and commercial data sources – Remote sensing data processing tools and software like ENVI, ERDAS, and QGIS for image analysis and interpretation

MODULE - VI APPLICATION OF REMOTE SENSING IN LAND AND WATER RESOURCE MANAGEMENT 7

LULC monitoring and change detection – Urbanization, deforestation, and agriculture impact – Remote sensing in water resource management – Surface and groundwater monitoring, watershed management, and flood assessment – Environmental applications like drought analysis, wetland mapping, and water quality assessment – Satellite data for sustainable planning

TOTAL : 45 PERIODS

TEXT BOOKS

1. Jensen, J. R (2007), Remote sensing of the environment: An earth resource perspective, Second edition, Pearson
2. Lillesand, T. M., Kiefer, R. W and Chipman, J. W (2008), Remote sensing and image interpretation, Seventh edition, Wiley
3. Rees, W. G (2012), Physical Principles of Remote Sensing, Third edition, Cambridge University Press

REFERENCES:

1. Joseph, G and Jeganathan, C. (2018), Fundamentals of Remote Sensing, Third edition, University Press

WEB REFERENCES:

1. <https://archive.nptel.ac.in/courses/105/101/105101206/>

ONLINE RESOURCES:

1. https://drive.google.com/file/d/1sMwuex68tmLcnxc6MsFCc3AR9V0n_Zkr/view

OUTCOMES:

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

1. Apply the principles of electromagnetic radiation to assess its interaction with the atmosphere and terrain features in remote sensing studies [K3]
2. Utilize remote sensing data acquisition systems and radiometric correction techniques for accurate interpretation of remotely sensed data [K3]

Recommended in Board of Studies (BoS) Meeting No. 10 held on 29.4.26

3. Select appropriate spectral characteristics and resolution types for environmental monitoring applications [K3]
4. Apply thermal and microwave remote sensing principles to solve earth observation and resource assessment problems [K3]
5. Make use of remote sensing platforms, sensors, and data processing tools for image analysis and interpretation. [K3]
6. Develop remote sensing-based approaches for land and water resource management to support sustainable planning [K3]

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	2	-	-	-	-	-	-	1	2
C02	3	-	-	-	2	-	-	-	-	-	-	1	3
C03	3	-	-	-	2	-	-	-	-	2	-	1	3
C04	3	-	-	-	2	-	-	-	-	-	3	1	3
C05	3	-	-	-	2	-	-	-	-	2	-	1	3
C06	3	-	-	-	2	-	-	-	-	-	3	3	3

PROFESSIONAL ELECTIVES - II

COURSE CODE: 24CEEL524	GLOBAL NAVIGATION SATELLITE SYSTEMS AND APPLICATIONS	L 3	T 0	P 0	CP 3	C 3
NPTEL CODE: 105107194	SYLLABUS VERSION 1.0	SDG NO. 4, 9, 13				
PRE-REQUISITE COURSES	-					

OBJECTIVES:

- Explain the basic principles, components, and working mechanisms of Global Navigation Satellite Systems (GNSS), including position determination techniques

Analyze the features, functionalities, and applications of major GNSS constellations along with augmentation systems like DGNSS, RTK, and SBAS.

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- Examine the limitations, errors, correction methods, and diverse applications of GNSS in various fields, along with emerging trends and opportunities in India

MODULE - I INTRODUCTION TO GNSS AND POSITIONING PRINCIPLES

8

Evolution of navigation systems – Overview of GNSS constellations (GPS, GLONASS, Galileo, BeiDou) – GNSS components: space, control, and user segments – Fundamentals of satellite ranging and pseudo-range measurement – Trilateration and multilateration techniques – Time synchronization, satellite clock errors, and signal structure with frequency bands – Atmospheric effects and error sources in GNSS positioning

MODULE - II GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) CONSTELLATIONS

7

GNSS constellations overview and interoperability – BeiDou Navigation Satellite System: constellation design, signal structure, and services – Galileo system: architecture, signals, and services – Comparison of GNSS constellations (GPS, GLONASS, Galileo, BeiDou) – Multi-GNSS integration and performance advantages – Applications of multi-constellation GNSS in positioning and navigation

MODULE - III REGIONAL NAVIGATION SATELLITE SYSTEMS

7

Indian Regional Navigation Satellite System – Components, operational satellites, signal characteristics, and applications in India – Quasi-Zenith Satellite System – Japan's regional satellite system, purpose, working mechanism, and augmentation role in GNSS

MODULE - IV GNSS ERRORS, CORRECTIONS, AND AUGMENTATION SYSTEMS

8

DGNSS – Principles, working, advantages, and applications. - RTK – Correction techniques, accuracy, and field applications. - SBAS – Augmentation principles, major systems (WAAS, EGNOS, GAGAN), and benefits. - GNSS Errors – Satellite, atmospheric, receiver, and multipath errors. - GNSS Correction Methods – Differential corrections, augmentation, and filtering techniques

MODULE - V GNSS ACCURACY AND APPLICATIONS

8

Causes of altitude errors, geometric dilution of precision (GDOP), atmospheric effects, and error mitigation techniques - GNSS Applications – Navigation,

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mapping, surveying, transportation, and precision agriculture - Disaster management, environmental monitoring, autonomous vehicles, and military applications

MODULE - VI GNSS TRENDS AND OPPORTUNITIES

7

GNSS - Current Trends and Future – Advancements in GNSS technology, multi-constellation integration, and emerging innovations - Opportunities in India – Government initiatives, industry applications, research prospects, and future developments in Indian GNSS

TOTAL : 45 PERIODS

TEXT BOOKS

1. Awange, J. L., 2012. Environmental Monitoring using GNSS: Global Navigation Satellite Systems, Springer, London.
2. Bhatta, B., 2010. Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others, BS Publications, New Delhi.
3. Grewal, M. S., Weill, L. R., Andrews, A. P., 2006. Global Positioning Systems, Inertial Navigation, and Integration, John Wiley & Sons, New York.

REFERENCES:

1. Hofmann-Wellenhof, B., Lichtenegger, H., Wasle, E., 2008. GNSS – Global Navigation Satellite Systems, Springer, Verlag Wien.
2. Hofmann-Wellenhof, B., Lichtenegger, H., Collins, J., 2001. Global Positioning System Theory and Practice, Springer, Verlag Wien.
3. Tan, S., 2018. GNSS Systems and Engineering: The Chinese Beidou Navigation and Position Location Satellite, John Wiley & Sons, Singapore

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_ce77/preview

ONLINE RESOURCES:

1. <https://archive.nptel.ac.in/courses/105/107/105107194/>

OUTCOMES:

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

1. Identify the components of GNSS, positioning principles, and satellite navigation systems used for location determination [K3]
2. Select suitable GNSS constellations such as GPS, BeiDou, and Galileo for specific navigation and positioning applications. [K3]

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3. Utilize regional navigation systems such as IRNSS and QZSS for positioning and navigation purposes. [K3]
4. Apply GNSS error correction techniques and augmentation systems to improve positioning accuracy. [K3]
5. Make use of GNSS technologies in engineering, transportation, surveying, and societal applications. [K3]
6. Develop solutions using recent GNSS technologies to address emerging positioning and navigation requirements in India. [K3]

CO - PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	-	-	-	2	-	-	-	-	-	-	1	2
C02	3	-	-	-	2	-	-	-	-	2	-	1	2
C03	3	-	-	-	2	-	-	-	-	-	-	1	2
C04	3	-	-	-	2	-	-	-	-	2	-	1	3
C05	3	-	-	-	2	-	-	-	-	-	3	3	3
C06	3	-	-	-	2	-	-	-	-	-	3	2	3

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Make it happen!*



Together let's build a better world where there is **NO POVERTY** and **ZERO HUNGER**.
We have **GOOD HEALTH AND WELL BEING**, **QUALITY EDUCATION** and full **GENDER EQUALITY** everywhere.
There is **CLEAN WATER AND SANITATION** for everyone. **AFFORDABLE AND CLEAN ENERGY**
which will help to create **DECENT WORK AND ECONOMIC GROWTH**. Our prosperity shall be fuelled
by investments in **INDUSTRY, INNOVATION AND INFRASTRUCTURE** that will help us to
REDUCE INEQUALITIES by all means. We will live in **SUSTAINABLE CITIES AND COMMUNITIES**.
RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.
CLIMATE ACTION will reduce global warming and we will have abundant,
flourishing **LIFE BELOW WATER**, rich and diverse **LIFE ON LAND**.
We will enjoy **PEACE AND JUSTICE** through **STRONG INSTITUTIONS**
and will build long term **PARTNERSHIPS FOR THE GOALS**.



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everyone needs to do their part:
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